

UNIVERSITY OF KWAZULU-NATAL

Investigating Engineering Knowledge Management as a Foundation for Capability
Development at Engen Refinery.

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Declaration

I, Cameron Byron Pitman, declare that:

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To my amazing wife Charné, thank you for all the love and support you have shown me whilst I completed this study. You are my sky full of stars, always able to light up my path.

To my late father Garry Pitman, thank you for always pushing me to question everything around me; I owe my curiosity to you.

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Executive Summary

This research was completed in the area of knowledge management as it was deemed to be a crucial success factor for engineering competency development at Engen Refinery. The research conducted was qualitative in nature, utilising a phenomenological approach. The dissertation is structured around three foundational objectives aligned to personal knowledge management, organisational knowledge management and communities of practice.

Within the paradigm of personal knowledge management, when comparing the findings from primary and secondary research it was noted that a structure was lacking within Engen from which both individuals and the organisation could base its PKM development

An analysis of the findings for organisational knowledge management approaches, highlighted that the alignment between individual and organisations goals needs to be understood in terms of the correct manner in which leadership attempt to manage knowledge from an organisation wide knowledge strategy.

Although the major finding from the primary research was the applicability of the COP towards ACD gap closure, it was deemed that there were currently too many barriers to knowledge sharing for a COP to be a suitable approach at Engen. The recommendation for implementation within a community perspective is for the organisation to follow the knowledge ecology concept in terms of structure.

The recommendations from this research presents four proposed strategies to which implementation would require a focus on individual PKM approaches, organisational PKM approaches, OKM approaches and lastly a knowledge ecology approach to COPs.

Contents

Declaration	ii
Acknowledgements	v
Executive Summary	vi
Contents	vii
List of Tables	xi
List of Figures	xiii
List of Abbreviations	xiv
Chapter One - Introduction to the Study	1
1.1 Introduction	1
1.2 Background and Motivation	1
1.3 Research Problem Statement	1
1.4 Research Objectives	2
1.5 Research Question	2
1.6 Significance of the Research	3
1.7 Limitations of the Study	3
1.8 Research Design and Methodology	4
1.9 Conclusion	4
Chapter Two – Background to the Study	6
2.1 Introduction	6
2.2 ACD Development in PETRONAS	6
2.3 ACD Role Out to Engen	8
2.4 Structure of the ACD Program	10
2.5 TP and TM Progression Routes	13
2.6 Conclusion	15
Chapter Three - Literature Review	16
3.1 Introduction	16
3.2 Knowledge and Knowledge Management	17
3.2.1 Knowledge as an Object	17
3.2.2 Knowledge as a Process	18
3.2.3 Tacit Knowledge and Explicit Knowledge	19
3.3 Personal Knowledge Management	21
3.3.1 Definition of PKM	21
3.3.2 Knowledge Worker	22

3.3.3	Information Overload.....	23
3.4	Organisational Knowledge Management	25
3.4.1	Introduction.....	25
3.4.2	Gaps between Individual Learning and Organisational Learning	25
3.4.3	Bridging the Gap between Individual Learning and Organisational Learning..	28
3.5	Communities of Practice	32
3.5.1	Introduction.....	32
3.5.2	Three Dimensions of COPs	32
3.5.3	Roles and Responsibilities in COPs.....	33
3.5.4	Tri Benefit of COPs	34
3.5.5	Knowledge Management Building Blocks	35
3.5.6	Rewards and Recognition	37
3.6	Personal Knowledge Networks	39
3.6.1	Knowledge Network	39
3.6.2	Knowledge Ecology.....	39
3.7	Conclusion.....	40
Chapter Four - Research Design and Methodology.....		41
4.1	Introduction	41
4.2	Research Methodology.....	41
4.2.1	Qualitative Research	41
4.2.2	Quantitative Research	43
4.2.3	Mixed Methods or Triangulation Research	44
4.2.4	Methodology Selected	45
4.3	Sampling.....	46
4.4	Target Population and Respondents.....	48
4.5	Data Collection Methods.....	49
4.5.1	Data collection/procedure	49
4.5.2	Primary Data Collection	49
4.5.3	Secondary Data Collection	49
4.6	Construction of the Research Instrument.....	50
4.7	Trustworthiness	50
4.8	Credibility.....	51
4.9	Pilot Study.....	51
4.10	Ethics Considerations.....	52
4.11	Data Analysis	53

4.11.1	Shortcomings and Sources of Error	54
4.12	Conclusion	55
Chapter Five - Results and Discussions		56
5.1	Introduction	56
5.2	Results	57
5.2.1	Demographic and Experience	57
5.2.2	Personal Knowledge Management	61
5.2.3	Objective 1: To Identify the Level of Use of Personal Knowledge Management Strategies within the Engineering Knowledge Workers at Engen.	85
5.2.4	Organisational Knowledge Management.....	86
5.2.5	Objective 2: Gain an Understanding of the Impact of Organisational Knowledge Management Strategies within Engen.	109
5.2.6	Communities of Practice.....	110
5.2.7	Objective 3: Develop a Community of Practice Structure as a Knowledge Management Strategy for Engen.	139
5.2.8	Objective 4: Recommendations for Systematic and Holistic Knowledge Management Strategies towards Sustainable Knowledge Transfer within the Engineering Knowledge Workers at Engen.....	141
5.3	Conclusion.....	142
Chapter Six - Conclusions and Recommendations		143
6.1	Introduction	143
6.2	Recommendations from Analysis of Field Research and Literature.....	143
6.2.1	Objective 1: Personal Knowledge Management Strategies	143
6.2.2	Objective 2: Organisational Knowledge Management Strategies	146
6.2.3	Objective 3: Community of Practice as a Knowledge Management Strategy.	149
6.3	Recommendations for Further Research	151
6.4	Conclusion.....	151
Chapter Seven - References		152
Appendix A: ACD Resources		159
A1:	Skills Development Matrix	159
A2:	Training Roadmap.....	160
A3:	Technology Inventory and Ruler.....	161
Appendix B: Research Instruments		162
B1:	Informed Consent Letter.....	162
B2:	Research Instrument	166
Demographic and Experience.....		166

Personal Knowledge Management	166
Organisational Knowledge Management	166
Communities of Practice	167
B3: Gatekeepers Letter.....	168
B4: Ethical Clearance.....	169
B5: TurnItIn Report.....	170
B6: Permission to Submit.....	171

List of Tables

Table 2-1: ACD Redefines the Approach to Technical Capability Development.....	7
Table 2-2: Engen Technical Professional (TP) Inventory Assessment	9
Table 2-3: Comparison of Roles and Responsibilities between TP and TM.....	13
Table 3-1: Knowledge Management Definitions - Metaphor of Knowledge as an Object	17
Table 3-2: Knowledge Management Definitions - Metaphor of Knowledge as a Process.....	18
Table 3-3: Comparison between Explicit and Tacit Knowledge Properties.....	19
Table 3-4: Description of the Three Dimensions of COPs	33
Table 3-5: Description of the Roles and Responsibilities of Members within a COP	33
Table 4-1: Qualitative Research Characteristics.....	42
Table 4-2: Research Worldviews Leading to Selection of Research Methodologies.....	45
Table 5-1: Analysis of Participant's Demographics.....	57
Table 5-2: Participant's Academic Background.....	58
Table 5-3: Participant's Petrochemical Experience	59
Table 5-4: Participant's Non Petrochemical Experience.....	59
Table 5-5: Meaning Unit - Passion for Learning	61
Table 5-6: Meaning Unit - Self Study.....	62
Table 5-7: Meaning Unit - Not Goal Focussed.....	63
Table 5-8: Meaning Unit - Previous Experience	64
Table 5-9: Meaning Unit - In Agreement with Lifelong Learning	66
Table 5-10: Meaning Unit - Continuous Development as an Energiser	67
Table 5-11: Meaning Unit - Learning from Subject Matter Experts	68
Table 5-12: Meaning Unit - Learning from Reading.....	68
Table 5-13: Meaning Unit - Acknowledgement of Conflict of Goals	71
Table 5-14: Meaning Unit - Importance of Mentorship	72
Table 5-15: Meaning Unit - Non Linear Development Path	73
Table 5-16: Meaning Unit - TM vs TP Development Ladder	75
Table 5-17: Meaning Unit - External Aspirations	75
Table 5-18: Meaning Unit - Agreement with Communication Information Overload.....	78
Table 5-19: Meaning Unit - Social Media Overload	79
Table 5-20: Meaning Unit - Disagree with Engineering Information Overload	80
Table 5-21: Meaning Unit - Information Seeking Skillset	81
Table 5-22: Meaning Unit - Personal Knowledge Network	83
Table 5-23: Meaning Unit - External Training Roadmap.....	86
Table 5-24: Meaning Unit - Internal Training Resources.....	87
Table 5-25: Meaning Unit - Job Rotation	88
Table 5-26: Meaning Unit - Technical Coaching	89
Table 5-27: Meaning Unit - Specialist Mentality	92
Table 5-28: Meaning Unit - Anti ACD.....	93
Table 5-29: Meaning Unit - Racial Divides.....	94
Table 5-30: Meaning Unit - Explicit Knowledge Capture.....	95
Table 5-31: Meaning Unit - High Staff Turnover.....	96
Table 5-32: Meaning Unit - Leadership Development	98

Table 5-33: Meaning Unit - Technical Development	99
Table 5-34: Meaning Unit - Non Supportive	100
Table 5-35: Meaning Unit - Influential Mentoring and Leadership	102
Table 5-36: Meaning Unit - Employee Aspirations for Internal Positions	104
Table 5-37: Meaning Unit - Opportunities for Development and Education	105
Table 5-38: Meaning Unit - Staff Turnover	107
Table 5-39: Meaning Unit - Semi Structure Approach.....	110
Table 5-40: Meaning Unit - Sharing of Knowledge	111
Table 5-41: Meaning Unit - Interaction between Like Minded Individuals	113
Table 5-42: Meaning Unit - ACD Gap Closure	114
Table 5-43: Meaning Unit - Creative Thinking	114
Table 5-44: Meaning Unit - Problem Solving	115
Table 5-45: Meaning Unit - Size of the COP	118
Table 5-46: Meaning Unit - COP Leadership.....	119
Table 5-47: Meaning Unit - Semi Structured Approach.....	120
Table 5-48: Meaning Unit - External Resources	121
Table 5-49: Meaning Unit - Training Opportunities.....	122
Table 5-50: Meaning Unit - Case Study	125
Table 5-51: Meaning Unit - Dual Knowledge Transfer.....	127
Table 5-52: Meaning Unit - Use of Theory	127
Table 5-53: Meaning Unit - Lessons Learnt	128
Table 5-54: Meaning Unit - Alignment to ACD.....	129
Table 5-55: Meaning Unit - Against Remuneration as a Reward.....	131
Table 5-56: Meaning Unit - Elevation of Respect	132
Table 5-57: Meaning Unit - Desire to Share.....	134
Table 5-58: Meaning Unit - Non Financial Reward	135
Table 5-59: Meaning Unit - Financial Reward	135
Table 6-1: Individual PKM Strategy.....	144
Table 6-2: Organisational PKM Strategy	145
Table 6-3: Organisational KM Strategy.....	147
Table 6-4: Knowledge Ecology KM Strategy	150

List of Figures

Figure 2-1: Comparison between Engineering Technical Professional (TP) and Management (TM).....	10
Figure 2-2: Assessment, Technical Coaching and Training Cycle towards TP and TM Development	11
Figure 3-1: A Holistic Analysis of Learning Factors.....	30
Figure 0-1: Template for Coding a Phenomenological Study	54
Figure 5-1: Phenomenological Code for Question 5	65
Figure 5-2: Phenomenological Code for Question 6	70
Figure 5-3: Phenomenological Code for Question 7	77
Figure 5-4: Phenomenological Code for Question 8	84
Figure 5-5: Phenomenological Code for Question 9	91
Figure 5-6: Phenomenological Code for Question 10	97
Figure 5-7: Phenomenological Code for Question 11	101
Figure 5-8: Phenomenological Code for Question 12	108
Figure 5-9: Phenomenological Code for Question 13	117
Figure 5-10: Phenomenological Code for Question 14	124
Figure 5-11: Phenomenological Code for Question 15	130
Figure 5-12: Phenomenological Code for Question 16	138

List of Abbreviations

ACD:	Accelerated Capability Development
BSc:	Bachelors of Science
BTech:	Bachelors of Technology
COP:	Community of Practice
FM:	Functional Manager
GM:	General Manager
IDP:	Individual Development Plan
IPC:	Individual Performance Contract
IT:	Information Technology
KM:	Knowledge Management
KPI:	Key Performance Indicator
OKM:	Organisational Knowledge Management
PETRONAS:	Petroleum Nasional Berhad
PKM:	Personal Knowledge Management
PKN:	Personal Knowledge Network
POE:	Portfolio of Evidence
PTG:	Process Technology Group
SDM:	Skills Development Matrix
SKN:	Social Knowledge Network
SKG:	Skills Group
SME:	Subject Matter Expert
T&D:	Training and Development

TI&R:	Technology Inventory and Ruler
TM:	Technical Manager
TP:	Technical Professional
T-REX:	Transforming Refinery Excellence
TRM:	Training Roadmap
TTA:	Time to Autonomy

Chapter One - Introduction to the Study

1.1 Introduction

This chapter outlines the reasons for the research, the methodology and explains how it was conducted. The manner in which the primary and secondary data aligned to the selected research topic of *Investigating Engineering Knowledge Management as a Foundation for Capability Development at Engen Refinery* was collected; is discussed. Following the analysis of examiners the title was proposed to omit the word “*investigating*” as it was deemed superfluous. This is noted, however due to the complexity of formally changing the title of the research, it was only changed within the body of the dissertation and not on the cover, ethical clearance or TurnItIn reports. Also discussed in this chapter are the research objectives and questions aligned to the requisites of the study to develop systematic and holistic knowledge management strategies for the sustainable knowledge transfer within the engineering knowledge workers at Engen.

1.2 Background and Motivation

Knowledge Management and the concepts aligned to it presented an opportunity to explore the degree to which Knowledge Management is practiced within the engineering development programme at Engen. The background to the study was deemed extensive enough to dedicate a chapter to it and the reader is prompted to progress to Chapter Two – Background to the Study, where a full analysis is given.

1.3 Research Problem Statement

Having conducted preliminary investigations at Engen in the field of research a consensus was found amongst the engineering staff, that there were minimal systems in place to facilitate the transfer of both explicit and tacit knowledge between subject matter experts and junior engineers. As knowledge transfer cannot be divorced from the holder of the

knowledge, the facilitation of both interpersonal systems as well as information systems, need to be considered to derive systematic and holistic knowledge management strategies (Snowden, 2011).

1.4 Research Objectives

- To identify the level of use personal knowledge management strategies within the Engineering knowledge workers at Engen.
- Gain an understanding of the impact of organisational knowledge management strategies within Engen.
- Develop a community of practice structure as a knowledge management strategy for Engen.
- Recommendations for systematic and holistic knowledge management strategies towards sustainable knowledge transfer within the engineering knowledge workers at Engen.

1.5 Research Question

- To what extent does the theory of personal knowledge management align with actual practices of the engineering knowledge workers at Engen?
- How could the use of organisational knowledge management strategies be best leveraged within Engen?
- What structure and strategy is needed for a community of practice to become a successful knowledge management strategy at Engen?
- What would be the most systematic and holistic knowledge management strategy for the sustainability of knowledge transfer within the engineering knowledge workers at Engen?

1.6 Significance of the Research

The significance or rationale for this study was to provide an insight into the complex study of engineering capability development. It had been perceived that strategic leverage could be gained by the organisation if a greater focus was placed on its engineering knowledge workers developing of their knowledge management skills. Notably the philosophy of personal knowledge management and the various forms of knowledge networking are proposed to create the foundation for the sharing of both explicit and tacit knowledge within the organisation. Together these strategies were hypothesized to be able to facilitate the growth of engineering capability within Engen's refinery.

1.7 Limitations of the Study

This research was confined to the engineering knowledge workers at Engen Petroleum's oil refinery in Durban South. This research did not attempt to analyse knowledge workers within the other oil refineries in South Africa. This was due to the limited funding resources available as well as access issues where refineries would be unwilling to have an employee of their competitors conducting such research.

As such the recommendations made are based on the findings of this study only. If the recommendations are to be implemented elsewhere, they will need to be closely monitored within the environment under consideration to ensure that the process does not deviate and that the desired outcome is achieved.

A further limitation was placed on the study as due to the selection of qualitative study utilising a phenomenological approach, the study could not include every engineering knowledge worker. Thus a purposeful sampling method was used to select the engineers who have reached the level of technical professional (TP), on their development structure. Thus no findings were sought from engineers who have not reached this level.

A further purposeful sampling approach was used to focus in on a single skills group within the Engen TPs. Thus a limitation of this study is that the findings do include the views of Engen TP's outside of the Process Technology Group (PTG).

This was a small scale study, with the fieldwork conducted being self-funded. A study with greater funding could have resulted in more comprehensive findings concerning Engen's TPs, yielding additional intuitions.

1.8 Research Design and Methodology

Following the development of the research questions and objectives, a study of the available literature was conducted. This was to create a theoretical construct from which the field research could be focussed on as well as ultimately compared to in the development of systemic and holistic knowledge management strategies towards capability development at Engen Refinery. The field research was qualitative in nature. The use of the phenomenological approach was undertaken as supported by Creswell, (2007). The findings were coded according to significant statements into meaning units of the phenomenon discussed in the field interviews. From these meaning units a further level of analysis will reveal "what" as well as "how" a phenomenon was experienced by the participants, known as the textural and structural descriptions respectively. Together these drove the development of the essence of the phenomenon, (Creswell, 2007, p. 159).

The essence of the phenomenon as experienced by the participants was compared to the literature reviewed. Any perceived crucial gaps in the knowledge management approaches have been presented as recommendations for the organisation to consider for implementation.

1.9 Conclusion

The purpose of this chapter was to introduce to the reader the area of research being conducted. The research problem statement resulted in the research objectives and questions being formulated in such a manner that they were aligned to personal knowledge management (PKM), organisational knowledge (OK) management and communities of practice (COP). The resultant view was that a combination of strategies from PKM, OK and COP together could form a systematic and holistic knowledge management strategy for the

sustainable knowledge transfer within the engineering knowledge workers at Engen. Chapter Five - Results and Discussions highlights this approach.

In the next chapter, Chapter Two – Background to the Study, a greater understanding is developed of the status quo of capability development for engineers at Engen. This status quo developed from secondary resources within the organisation and was used to develop the focus of the study of external literature in Chapter Three - Literature Review.

Chapter Two – Background to the Study

2.1 Introduction

The purpose of this chapter is to set the foundation to the status quo of technical capability development at Engen Petroleum. In the sections to follow an understanding will be developed regarding the background and motivation for the study inclusive of an explanation of the implementation and utilisation of the Accelerated Capability Development (ACD) program since its conception within PETRONAS in 2006. An explanation will be given on the current philosophy around engineering technical development within Engen which is traditionally linear and not aligned to the principals and strategies found in the field of study of knowledge management.

2.2 ACD Development in PETRONAS

As outline in *Developing Leaders within Emerging Multinationals - The Petronas Way* by Zawawi, et al., (2013) in 2006, Petroleum Nasional Berhad (PETRONAS), a Malaysian based petrochemical processing giant was posed with a dilemma when a study suggested that their engineer's time to autonomy (TTA) in comparison to world-wide industry was below the standard for petroleum companies. This capability measurement is defined as the experiential period in years a junior engineer needs to become independent in his/her problem solving ability. The above mentioned study suggested that the PETRONAS average TTA was measured to be thirteen years, (Zawawi, et al., 2013).

As a solution, it was proposed to development a technical capability developmental framework, called the Accelerated Capability Development (ACD) Programme. In Table 2-1 below, a comparison can be seen between what was deemed as a status quo in 2012 to the expected outcomes of the ACD programme (Engen Petroleum, 2012). The pilot exercise was a success in Malaysia as the TTA was reduced to seven years ten months, (Zawawi, et al., 2013).

Table 2-1: ACD Redefines the Approach to Technical Capability Development

(Engen Petroleum, 2012)

Approach	Status Quo	ACD
Focus	Broad based	Early specialisation
Job Exposure	Broad and operational	Focused rotations
Assessment	Infrequent	Early and regular
Promotion	Time and HR process based	Competency-based
Coaching	Informal	Dedicated and enforced
Training	Based on availability	Focused and enforced

2.3 ACD Role Out to Engen

The ACD program was rolled out in 2012 to PETRONAS subsidiary companies inclusive of South Africa's Engen Petroleum Limited. Their oil refinery in the Durban South basin employs engineers from various technical backgrounds. Engen like PETRONAS had realised the importance of having a technical capability development system through a companywide assessment completed in 2010 known as Transforming Refinery Excellence (T-REX). As noted in the *Technical Capability Building Engagement Session* by Engen (2012), findings from the T-REX assessment were:

- There was no centralised technical capability development program. This resulted in no true tracking and monitoring of technical competencies amongst Engen refinery's engineers.
- There was a lack of sustainable coaching plans and no measures in place to develop such programs (Engen Petroleum, 2012, p. 12).

The impact of these findings were found to be that engineers were not properly assessed, tracked and guided towards their technical capability development. As an organisation this left Engen in an unsustainable situation and as such the recommendation from PETRONAS was that they too should adopt and implement the ACD program, (Engen Petroleum, 2012, p. 12).

To enter into the ACD program an engineer needs to be in possession of either a Bachelor's of Science in Engineering (BSc) or a Bachelor's of Technology in Engineering (BTech). Additional to this the engineer is required to have at least one year post graduate experience. Thereafter engineers at Engen are required to join one of the following skills groups (SKGs) which are listed in

Table 2-2: Engen Technical Professional (TP) Inventory Assessment below, Engen Petroleum, 2012).

Table 2-2: Engen Technical Professional (TP) Inventory Assessment

(Engen Petroleum, 2012)

Skills Group	Engineering Field	Discipline	PRINCIPAL	STAFF
12.1	Mechanical Engineering	Rotating Equipment	0	2
12.2	Mechanical Engineering	Static Equipment – Unfired	0	1
12.2	Mechanical Engineering	Static Equipment – Fired	0	0
12.2	Mechanical Engineering	Piping	0	2
12.3	Mechanical Engineering	Reliability Engineering	0	0
13	Electrical Engineering	Distribution	0	1
13	Electrical Engineering	Protection	0	1
14	Instrumentation	Instrumentation and Control	0	1
15	Materials, Corrosion and Inspection Engineering	Corrosion Engineering	0	0
15	Materials, Corrosion and Inspection Engineering	Inspection Engineering	0	1
16.3	Process Technology	Fractionation	1	2
16.3	Process Technology	Aromatics	0	0
16.3	Process Technology	Upgrading	1	3
16.3	Process Technology	Utilities & Off sites	1	2
16.3	Process Technology	Hydrotreating and Reforming	1	2
16.3	Process Technology	Treating	1	2
16.4	Process Technology	Advanced Process Control	1	1
18	Health, Safety and Environment	Environmental Engineering	0	1
19	Project Management	Project Management	0	1
Total			7	22

2.4 Structure of the ACD Program

The basis of the ACD program is an annual oral assessment whereby technical knowledge is measured and personal gaps are identified. As illustrated by Haripersad (2012), engineers progress on a technical professional (TP) ladder from Trainee Engineer through the ranks of Engineer, Senior Engineer, Staff Engineer, Principal Engineer and ultimately Custodian as in Figure 2-1, (Haripersad, 2012). In Figure 2-1 it can also be noted that the progression of a Senior Engineer to Staff Engineer can be bridge into a Manager role thus engineers can follow a technical manager (TM) progression route from Manager to Functional Manager (FM) to General Manager (GM).

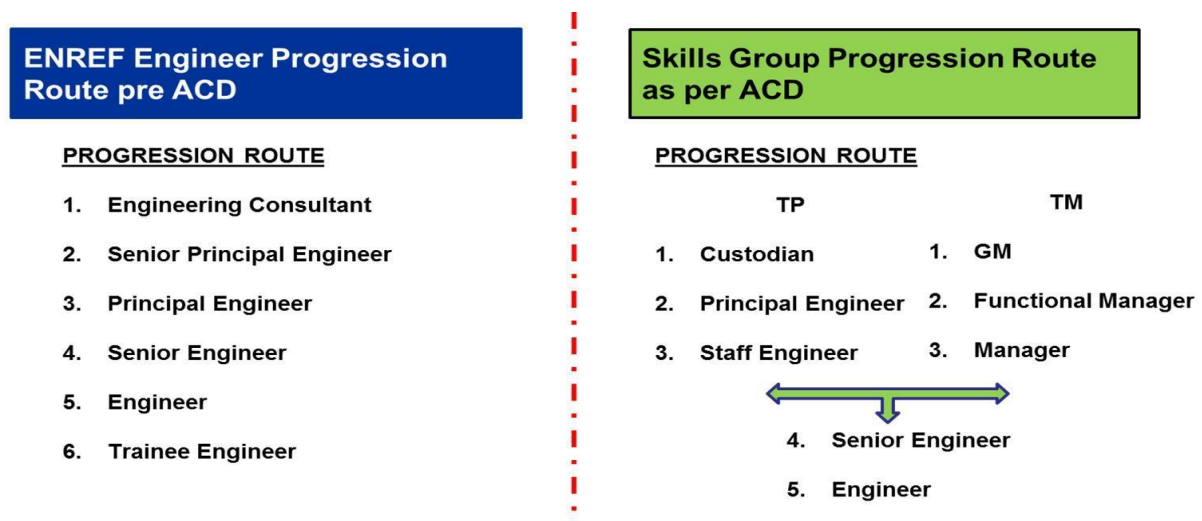


Figure 2-1: Comparison between Engineering Technical Professional (TP) and Management (TM)

(Haripersad, 2012)

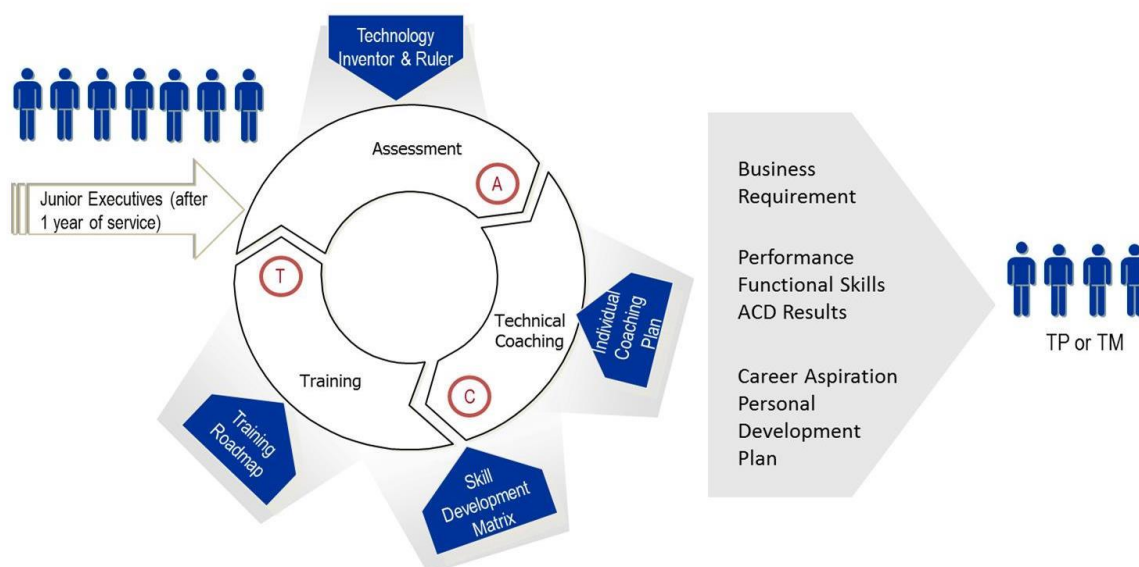


Figure 2-2: Assessment, Technical Coaching and Training Cycle towards TP and TM Development

(Haripersad, 2012)

As can be seen in Figure 2-2 above, there is a cycle between assessment, technical coaching and training. Each of these elements are supported by Technology Inventory and Ruler (TI&R) (PETRONAS, 2010), Skills Development Matrix (SDM) (PETRONAS, 2009) and the Training Roadmap (TRM) (PETRONAS, 2009) which can be found for reference purposes for SKG 12.2 Piping Engineering in

The entry point for this cycle is the baseline assessment, where an engineer is assessed against each of the technology categories in the TI&R, (PETRONAS, 2010). An engineer being assessed is deemed to either have awareness, knowledge, skilled, advanced or expert for each technology category. Based on the results of the baseline assessment an engineer is placed at a certain level aligned to the engineer progress ruler outline in Appendix A: ACD Resources. The assessors present an assessment report to the engineer with relevant capability gaps outlined in line with the requirements for the next promotion.

Together with a technical coach the engineer is required to use their assessment report and the information available in the SDM to develop an individual coaching plan, which is aligned to the self-learning and hands-on exposure required to progress from example knowledge to skilled for a particular technology.

If the competency cannot be closed by self-learning or hands-on exposure the option for the engineer to attend external training courses is outlined in the TRM which acts as a guide for the selection of relevant training courses.

The goal then for each individual engineer is to develop their knowledge through a combination of interventions in an often quoted ratio of 70:20:10 from Trainee Engineer to Senior Engineer level. This ratio was developed by Michael Lombardo and Robert Eichinger (2000) for the Centre for Creative Learning, which in summary can be understood that all learning and development should ideally comprise of:

- 70% of the learning is achieved in the actual execution of work activities,
- 20% of the learning is achieved through the guidance and feedback from more experienced personnel in the form of coaches and mentors,
- 10% of the learning is achieved through formal education and training programs, (Lombardo & Eichinger, 2000).

2.5 TP and TM Progression Routes

Haripersad (2012), in Figure 2-2 on page 11 suggests that the decision of whether an engineer follows a TP or TM path is dependent on:

- The business requirement,
- Engineer's functional performance and skills,
- Engineer's results from ACD assessment,
- Personal career aspirations,
- Personal development plan, (Haripersad, 2012).

At the senior engineer level the progression to TP or TM is throttled by business requirement. The managerial route is defined by the organisational structure, and as such if a department already has a manager, movement up the managerial ladder is difficult. In the same way organisationally the number of Staff and Principal Engineers per Skills Group are defined in

Table 2-2: Engen Technical Professional (TP) Inventory Assessment on page 7. (Engen Petroleum, 2012)

Table 2-3: Comparison of Roles and Responsibilities between TP and TM

(Engen Petroleum, 2012)

Technical Professional (TP) Path	Technical Manager (TM)
Become a subject matter expert (SME) for inquiry	Be a part of the setting of business vision,
Deep knowledge of subject content	Develop broad knowledge and networks within the oil and gas industry
Coach and mentor technical staff	Focus on coaching of people towards greater performance
Support for the problem solving of plant issues	Responsible for business targets
Publish technical articles	Manage and lead diverse groups
Recommend reliable and cost effective technology to Engen	Acquire diverse experience across various skills groups
Maintain network with industry experts	Build relationships within the oil and gas

	industry
--	----------

The differences between the roles and responsibilities of a TP and TM can be seen in Table 2-3 above which can be summed up as defining whether someone has a passion and flair for the knowledge required to become a specialist in their particular field of engineering, known as SKG at Engen, (Engen Petroleum, 2012). The reality is though some people may have a flair for the people, budget and strategic elements that come with managing a department or group. Nonetheless the decision although important cannot be made before an engineer has passed out on their ACD assessment to the level of Senior Engineer.

Since 2012, an estimated 75 Engen engineers have been assessed with varying levels of success within the ACD programme. The structure and knowledge maps it produces allows individual engineers to be guided towards their development, however at present there is minimal interaction with their colleagues to share and collaborate on each other's knowledge base.

This interaction is crucial for the technical coaching program, presented by PETRONAS as being the strategy needed to navigate the hands-on or on-the-job exposure, the self-learning as well as classroom training components of the 70:20:10 ratios has failed to reach the same level of success in Engen, (Zawawi, et al., 2013). For the ACD to succeed within Engen, it is perceived that Engen needs to better leverage and lead its knowledge workers and knowledge management systems successfully towards a variety of strategies designed for both tacit and explicit knowledge within the engineering community.

2.6 Conclusion

This chapter was aligned to development of a foundation of the status quo of capability development at Engen with particular focus on the engineering knowledge workers following the Accelerated Capability Development (ACD) program. A background and explanation was given for the ACD program inclusive of the mechanisms for assessment of engineering knowledge towards either the TP or TM progression routes.

In the next chapter, Chapter Three - Literature Review presents an analysis of the secondary data pertaining to the research objectives outlined in Chapter One – Introduction to the Study. This secondary data forms the basis for the comparison to the primary data analysis in Chapter Five - Results and Discussions.

Chapter Three - Literature Review

3.1 Introduction

This chapter presents literature that is recent and pertinent to the topic and objectives of this research. Following its inception in the 1990s, the concept of Knowledge Management (KM) has aimed to become a universal tool used to: increase the productivity of knowledge workers as well increasing the competitive advantage of the organisation. According to Chatti (2012), despite isolated achievements aligned to growth and innovation within organisations, productivity and efficiency, employee learning as well as staff retention and satisfaction, in general KM has not demonstrated the competitive advantage worthy of the investment made by organisations across the world, (Chatti, 2012, p. 829).

Acknowledging the drawbacks of too broad a view of knowledge management view on organisational learning, a more personal perspective has been a focus of recent research where the interests in the topic of personal knowledge management (PKM) has steadily increased. (Gorman & Pauleen, 2011, p. 8).

Chatti (2012), suggests that the majority of the existing KM models do not address the relationship between personal knowledge management (PKM) and organizational knowledge management (OKM) (Chatti, 2012, p. 829). Within Chapter Three - Literature Review there is a review of various KM models aligned to the difficulties of twenty-first century learning environments which, as Chatti (2012) notes, require modern professionals to be constantly adaptive to the changing landscape of what constitutes knowledge. (Chatti, 2012, p. 829)

The sections to follow will present a selection of the theoretical concepts surrounding knowledge and knowledge management. Thereafter literature on knowledge management will be reviewed from both a personal and organisation perspective. Following this there will be a review analysing knowledge networks with specific focuses on the community of practice (COP), social knowledge network (SKN) and personal knowledge network (PKN) frameworks. The chapter concludes as the research moves onto Chapter Four - Research Design and Methodology.

3.2 Knowledge and Knowledge Management

Chatti (2012) acknowledged that to define knowledge is a difficult task. There are a number of definitions in literature, and although they often lack a precise consensus, the definitions generally revolve around two core views of knowledge:

- Knowledge as an object
- Knowledge as a process

The sections to follow will further detail these metaphors.

3.2.1 Knowledge as an Object

The majority of early knowledge management researchers had a static view of knowledge being an object, and as such the KM models focussed on technology-based representations of knowledge, (Chatti, 2012). This view of knowledge has led many attempts to create repositories to capture, store and control, manage and reuse what is deemed as structured knowledge. A review of a collection of definitions can be read in Table 3-1: Knowledge Management Definitions - Metaphor of Knowledge as an Object below.

Table 3-1: Knowledge Management Definitions - Metaphor of Knowledge as an Object

Author Name	Knowledge Management Definition
Davenport, T; Prusak, L	“Knowledge management is getting the right information to the right people at the right time” (Davenport & Prusak, 1998)
Ives, W; Torrey, B; Gordon, C	“Knowledge management, in its most current sense, may generally be thought of as the effort to make the knowledge of an organization available to those within the organization who need it, where they need it, when they need it, and in the form in which they need it.” (Ives, et al., 1997)
Wiig, K M	“KM is to understand, focus on, and manage systematic, explicit, and deliberate knowledge building, renewal, and application” (Wiig, 1997)

3.2.2 Knowledge as a Process

The second generation of knowledge management literature in comparison focusses on the people component of a KM system. This system is driven by a process of understanding how individuals and groups acquire, create, develop, disseminate, transfer and share knowledge amongst other each other, (Chatti, 2012). A review of a collection of definitions can be read in Table 3-2: Knowledge Management Definitions - Metaphor of Knowledge as a Process below.

Table 3-2: Knowledge Management Definitions - Metaphor of Knowledge as a Process

Author Name	Knowledge Management Definition
Nonaka, I; Takeuchi, H	“Our dynamic model of knowledge creation is anchored to a critical assumption that human knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge. We call this interaction knowledge conversion.” (Nonaka & Takeuchi, 2005)
Malhorta, Y	“Knowledge management includes various processes such as acquisition, creation, renewal, archival, dissemination, and application (conversion of new knowledge into action or behaviour modification) of knowledge.” (Malhotra, 2000)
Alavi, M; Leidner, D E	“KM is largely regarded as a process involving various activities. At a minimum, one considers the four basic processes of creating, storing/retrieving, transferring, and applying knowledge.” (Alavi & Leidner, 2001)
Davenport, T; Prusak, L; Strong, B	“We define knowledge management as a concerted effort to improve how knowledge is created, delivered and used.” (Davenport, et al., 2008)
Knapp, E M	“KM is a set of processes for transferring intellectual capital to value-processes such as innovation and knowledge creation and knowledge acquisition, organization, application, sharing, and replenishment.” (Knapp, 1998)

Following on from the paradigm of knowledge being a process, the duality of knowledge was conceived. Two popular views are the tacit vs explicit (Nonaka & Takeuchi, 1995) and participation vs reification (Wenger, 1998) are analysed in the sections to follow.

3.2.3 Tacit Knowledge and Explicit Knowledge

Carrillo and Chinowsky (2006), briefly explain that explicit knowledge is knowledge which is able to be physically stored in either a paper or electronic format. Tacit knowledge is that which is stored in the minds of people, making it more difficult to store in comparison to explicit knowledge. And as such tacit knowledge is best shared between individuals or small groups in a real time sharing of knowledge. (Carrillo & Chinowsky, 2006, p. 1) The characteristics of tacit and explicit knowledge are outlined in Table 3-3 below, (Nonaka & Takeuchi, 1995).

Table 3-3: Comparison between Explicit and Tacit Knowledge Properties

(Nonaka & Takeuchi, 1995)

Explicit Knowledge	Tacit Knowledge
Able to be expressed and coded	Difficult to codify and communicated
Generalized form of knowledge	Difficult to structure
Knowledge formed from rationality	Based on experience of individuals
Facts driven	Intuitive driven
Rules focussed knowledge	Knowledge based on experience
Methods focussed knowledge	Focussed on skills
Systematic and functional knowledge	Based on values and judgements

Polanyi (1958), compared tacit knowledge to Aristotle's intellectual value of *techne*. It is an internalise form of knowledge, a skill such as driving a car or playing a musical instrument, which has developed passed a certain threshold such the activity can be completed by muscle memory, achieved at a subconscious level, (Polanyi 1958, 56).

But as Tsoukas (1997), suggests that Polanyi was in fact arguing that tacit and explicit knowledge are not two separate entities of knowledge, but instead that:

“Tacit knowledge is the necessary component of all knowledge; it is nor made up of discrete beans which may be ground, lost of reconstituted... to split tacit from explicit

knowledge is to miss the point – the two are inseparably related,” (Tsoukas, 1997, p. 10).

Case and Gosling (2011) add to the understanding by noting that, tacit knowledge is complicated by unusual levels of rational conscious thought, the driver of the motor vehicle or musician may stumble clumsily through the task that is normally second nature. Thus the encroachment of the rationally explicit within the domain of the tacit skill can result in a formation of "stage fright," (Case & Gosling, 2011, p. 22).

A further point to consider is that of Nonaka and Takeuchi (1995), who acknowledge that knowledge is imbedded in the experiences and interactions of individuals:

“Our dynamic model of knowledge creation, is anchored to a crucial assumption that human knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge. We call this interaction knowledge conversion. It should be noted that this conversion is a social process between individuals and not confused within an individual,” (Nonaka & Takeuchi, 1995, p. 10).

Nonaka and Takeuchi (1995), further suggest that tacit knowledge is possessed by individuals, and as such any knowledge created at the organisational level is merely the extraction of the tacit knowledge and spread across the organisation by socialising processes, (Nonaka & Takeuchi, 1995).

3.3 Personal Knowledge Management

Rachel Jones and colleagues (2011) note that traditional organisational knowledge management (OKM) focusses on the flow of knowledge across the organisation within the already created knowledge system; the concept of personal knowledge management (PKM) in contrast focusses in on the management of individual knowledge basis.

3.3.1 Definition of PKM

Gorman and Pauleen (2011), note that PKM as a management direction has developed from the combination of diverse fields such as knowledge management (KM), personal information management, cognitive psychology, management science, philosophy and communications amongst others, (Gorman & Pauleen, 2011, p. 2).

The purpose of a PKM strategy is aligned to an individual's development to become effective in personal, organisational as well as social environments. In comparison to the traditional focus of KM to manage the individual's knowledge for the benefit of the organisation, the core focus of PKM is personal enquiry. To master this personal enquiry, the authors suggest that there are four essential and practical areas to be developed: learning, communication, interpersonal skills and use of technology, (Gorman & Pauleen, 2011, p. 2).

Wright (2005), proposed that PKM is a culmination of:

"Cognitive, information, social learning and development competencies, which individuals draw on to function effectively in the workplace," (Jones, et al., 2011, p. 82).

Jones et al (2011), give us a broad definition of PKM as:

"an individual's ability to develop, acquire and utilise skills that will support their learning in an information-abundant, ever changing and system-based environment, that it, an organisation," (Jones, et al., 2011, p. 82).

Frاند and Hixon (1999), in *Exploring the Linkages between Personal Knowledge Management and Organisational Learning* define PKM as:

“A system designed by individuals for their own personal use. It is a conceptual framework for organising and integrating information that we as individuals feel is important so that it becomes part of our personal knowledge base. It provides a strategy for transforming what might be random pieces of information into something that can be systematically applied and that expands our personal knowledge,” (Cheong & Tsui, 2011, p. 190).

3.3.2 Knowledge Worker

Davenport in Efimova's (2004), article: *Discovering the Iceberg of Knowledge Work a Webblog Case* believes that:

“When it comes to knowledge workers, we pretty much hire smart people and leave them alone. No quality measurements, no Six Sigma, no reengineering. We haven't formally examined the flow of work, we have no benchmarks, and there is no accountability for the cost and time these activities consume. As a result, we have little sense of whether they could do better,” (Efimova, 2004).

Gorman and Pauleen (2011), suggest that the turbulent working environment is a major factor affecting the modern day knowledge worker. This dynamic seems to have ended the social compact of a single career, and lifetime employment within a single organisation, which prior to the twenty-first century was an ideology to aspire to for many professionals. The responsibility for self-development and the attitude to lifelong learning are the responsibility of the individual, who ultimately control their future career paths. The ability to maintain, develop and market individual skills have become the avenues to explore for the modern day knowledge worker to create a competitive advantage in the job market, (Gorman & Pauleen, 2011, p. 3).

3.3.2.1 Definition of Knowledge Worker:

Delport (2011), acknowledges that knowledge workers are the drivers of innovation and growth within 21st century organisations and defines a knowledge workers as those who:

“Have high degrees of expertise, education or experience, and the primary of their jobs involves the creation, distribution or application of knowledge,” (Delpont, 2011, p. 167).

As such for companies to become more profitable in the future, it is imperative that knowledge workers become more productive and effective in their work environments. To achieve the continuous improvement of the work as viewed by the organisation produced by knowledge workers, it is crucial that individual capability development takes place. The logic is sound in that if an organisation were to improve the individual's ability to: create, acquire, process and use knowledge, there will be a knock-on improvement in terms of the work processes they are involved in as well as the organisations to which they are in employment, (Delpont, 2011, p. 168).

3.3.2.2 Capabilities of Knowledge Workers

Delpont (2011), in *Personal Knowledge Management and Knowledge Worker Capabilities* advocates for the following capabilities to be entrenched by all knowledge workers, (Delpont, 2011, p. 171).

- The ability to capture knowledge in such a manner that others can benefit from it.
- Allowing for personal documents to become available for the use of others.
- The research skill aligned to finding knowledge created by oneself or by others.
- The social component of knowledge in which we are required to collaborate with knowledge workers in an effort to share valuable insights, (Delpont, 2011, p. 171).

3.3.3 Information Overload

Gorman and Pauleen (2011) suggest that it is common knowledge that individuals in the twenty first century face the enormous issue of constantly being bombarded with more information than they can comfortably assimilate and manage. This information can be delivered in personal streams of emails, text messages, phone calls and social media.

Additionally the multimedia delivered by radio, television and the Internet gives access to information of varying validity, (Gorman & Pauleen, 2011, p. 3).

The same authors go on to note that equally troublesome is the reality presented by information overload of becoming a cognitive barrier to sound decision making. The stresses caused by information overload is colloquially known as "paralysis by analysis," (Gorman & Pauleen, 2011, p. 3).

Within the same text Gorman and Pauleen (2011), also raise a valid argument that technology is both a cause and cure to information overload. This duality can be understood when considering that the knowledge worker is able to choose how to utilise the technology available to them. Technology is to be seen as a tool that can facilitate the development of PKM, but in no way should be considered as an equivalent to the philosophy of PKM, (Gorman & Pauleen, 2011, p. 3) .

Murphy (2011), proposes that the users of personal digital libraries are both retrievers and classifiers of the information at their disposal. Additionally they need to access data, as well as catalogue it. Holistically there is a need to juggle their need for data with a systemic understanding of its placement within taxonomies, indexing, and labelling, grouping etcetera. For this need to be obtained, often users of personal digital libraries are left to their own devices to create their own systems of information classification, (Murphy, 2011, p. 44).

As the user stores larger and larger amounts of data on their personal computers and other devices, there is an increasing need to categorise and organise the data systematically. However in general the personal information management skills required for this task are often lacking. As such our taxonomies are idiosyncratic. Thus if it weren't for efficient desktop search functions, many information users would come unstuck, (Murphy, 2011, p. 45).

3.4 Organisational Knowledge Management

3.4.1 Introduction

Thus it can be seen that knowledge management is the combination of both people-focussed and enterprise focussed knowledge strategies. As such it is crucial for organisations to align individual learning with the objectives of the corporate body. (Cheong & Tsui, 2011, p. 189)

Ikhera (2003), in *Exploring the Linkages between Personal Knowledge Management and Organisational Learning* argues that individual learning does necessarily lead to a development of organisational learning. It is therefore the task of the organisation to create relevant integrations such that individual learning can become part of the organisational learning processes, (Cheong & Tsui, 2011, p. 189)

3.4.2 Gaps between Individual Learning and Organisational Learning

Scarbrough and colleagues (1998), in *Exploring the Linkages between Personal Knowledge Management and Organisational Learning*: suggests that a learning organisation is one which primarily focusses on the valuing, managing and enhancing of their employees individual development (Cheong & Tsui, 2011, p. 198). Argyris and Schon in *Organisational Learning II: Theory Method and Practice* referenced by Cheong and Tsui (2011), suggest that although knowledge worker's learning activities could be facilitated by corporate learning systems, there is also a great chance that they could be constrained or inhibited by the same systems (Cheong & Tsui, 2011, p. 197). Kim (2002), in Cheong and Tsui (2011), critiques that the traditional model for a learning organisational poses a dual risk in the manner it often attempts to function without the consideration of knowledge workers as individuals or underestimating the unique complexities of the organisation in which it operates, (Cheong & Tsui, 2011, p. 198).

Jarvis (2005), in Cheong and Tsui defined learning as being a: "*process of transforming experience into knowledge, skills and attitudes,*" (Cheong & Tsui, 2011).

To gain a holistic understanding of the reasons for the gaps between individual and organisational learning we need to review the three aspects of learning namely: learning objectives, learning factors and the learning processes, (Cheong & Tsui, 2011, p. 194).

3.4.2.1 Learning Objectives

Cheong and Tsui (2011), suggest that individual learning objectives can be categorised as personal, job-related and/or social. Personal growth knowledge broadly includes knowledge that is not directly related to work or a social interaction, such as the ability to play a sport or a musical instrument. Job-related objectives are aligned to the acquisition of skills required to solve problems at work, ascertaining the standard of work required in present employment or even career advancement in the future. Social learning objectives in contrast are related to the development of skills necessary to communicate and interact with other people successfully in terms of both social and professional relationships, (Cheong & Tsui, 2011, pp. 194-195).

The organisational learning objectives can be aligned to effectiveness, efficiency, flexibility and ability to innovate. Effectiveness can be improved via the use of previous experience and subject matter experts. Responsiveness is the ability to quickly act on stimulus of the customer or another business unit from the organisation. Efficiency with regards to knowledge is measure by the manner in which knowledge is able to reused and transferred between subject matter expert and knowledge mentee. Innovation in contrast is aligned to both an analysis of industry best practices as well as facilitating strong knowledge teams in the form of communities of practice, (Cheong & Tsui, 2011, p. 201).

3.4.2.2 Learning Factors

Cheong and Tsui (2011), suggest that there are four intrinsic factors that affect the individual as an adult learner: personal characteristics, self-concept, orientation, immediate needs and internal motivation. Personal characteristics or demographics include: age, gender, marriage, job rank, salary and experience. Knowles et al (1998), in Cheong and Tsui (2011) acutely suggest that due to the variances in the individuals personal characteristics a random grouping of adult learners will be heterogeneous in composition of background, learning style, motivational levels, needs and goals. Thus they suggest it is imperative that there is an emphasis placed on the individual when developing learning strategies, (Cheong & Tsui, 2011, p. 205).

Self-concept is aligned to self-esteem and the manner in which individuals seek to have individuality of thought, and as such many knowledge workers put up a resistance to situations where they may feel that another individual is imposing their will onto them. Adult learners have a tendency to seek to orientate their learning towards the knowledge required for their present circumstances. Adult learners are generally more motivated to learn as well celebrate greater successes, when they can perceive that the learning will develop their skill set towards current problems they are encountering, (Cheong & Tsui, 2011, pp. 205-206).

Knowles and colleagues (1998), in Cheong and Tsui (2011), developed an argument that:

"Although adults are responsive to external stimuli (better jobs, promotion, higher salaries etc.) they are truly driven when confronted with self-imposed internal pressures (increased job satisfaction, quality of life, self-esteem." (Cheong & Tsui, 2011, p. 206)

Organisational learning factors can be categorised into: organisational structure, culture and technological infrastructure.

3.4.2.3 Organisational Structure

Cheong and Tsui (2011), believe that there are three common dimensions of an organisational structure namely: complexity, formalisation and centralisation. Complexity is a measure of the degree of vertical, horizontal and spatial differentiation within an organisation, and as complexity rises the effectiveness of knowledge dissemination will reduce. Formalisation is the degree to which jobs within the organisation are structured in terms of roles and responsibilities, again a higher measurement will result in an organisation that is resistant to innovation. Centralisation is a measurement of whether decision making is disseminated amongst the organisation or whether decisions need to be made at higher management levels, (Cheong & Tsui, 2011, p. 207).

3.4.2.4 Organisational Culture

Organisational culture can be defined as "a pattern of shared basic assumptions that a group has learned as it solved its problems of external adaption and internal integration." Park and colleagues (2004) in Cheong and Tsui (2011), found through empirical research that trust, sharing information freely and working in a collaborative environment are critical factors which need to be achieved before the successful implementation of knowledge management technologies (Cheong & Tsui, 2011, p. 207).

Parker (2000), as referred to by Muzondo and Ondaio-Okemwa (2015), refer to organisational culture as the components including the values and norms that are shared by the individuals and groups within an organisation. These values and norms are the form the traditions in which colleagues call on each other to obtain advice, discernments and info for the completion of their work related tasks, (Muzondo & Ondari-Okemwa, 2015, p. 1).

3.4.2.5 Technological Infrastructure

The role of technology within a learning organisation is to provide effective: collection, storage, processing, distribution and utilisation of crucial knowledge resources with the aim to improve IT effectiveness as well as satisfying IT users.

3.4.3 Bridging the Gap between Individual Learning and Organisational Learning

To create a bridge between individual learning and organisational learning it is necessary to first align the objectives of the interconnected learning systems. To do this an understanding needs to be developed of the factors influencing the processes of each system both in isolation and collaboration with one another. (Cheong & Tsui, 2011, p. 212)

3.4.3.1 Aligning Objectives

The learning objectives at the organisational levels are fundamentally focussed on improving the competitive advantage of the organisation as well as a form of social responsibility to the national talent network. In comparison individual learning objectives are more personal and related to current job and social aspirations. (Cheong & Tsui, 2011, p. 212)

The reality is the organisational learning goals cannot be made in alignment with every individual learning goals, thus if an individual decides to align their individual goals with those of the organisational, it will allow for a favourable learning environment which is both in support of, and supported by, the organisation. The organisation will focus its resources on individuals who can bring the greatest benefit to the organisation, thus it is the responsibility of the individual to align their goals if they wish to be a part of the synergistic environment. For this to be achieved there is a requirement for two-way communication to take place so that a thorough understanding can be had in an attempt to finding creative learning strategies which create a win-win outcome for both the organisation and the individual, (Cheong & Tsui, 2011, pp. 213-214).

3.4.3.2 Learning Factors

Cheong and Tsui suggest that "individuals are the agents of organisational learning," thus the organisation need to take the time to understand the variety of learning characteristics brought to the table by the mixture of human capital within the organisation. Parallel to this statement the authors also mention that individuals in their own capacity need to be aware of the organisational factors affecting learning, and ensure that they are not passive in their participation within the organisational learning environment such that they can maximise the benefit that they get to experience. (Cheong & Tsui, 2011, p. 214)

In Figure 3-1 below depicts a holistic view of the learning factors from both the organisation and individual perspectives.

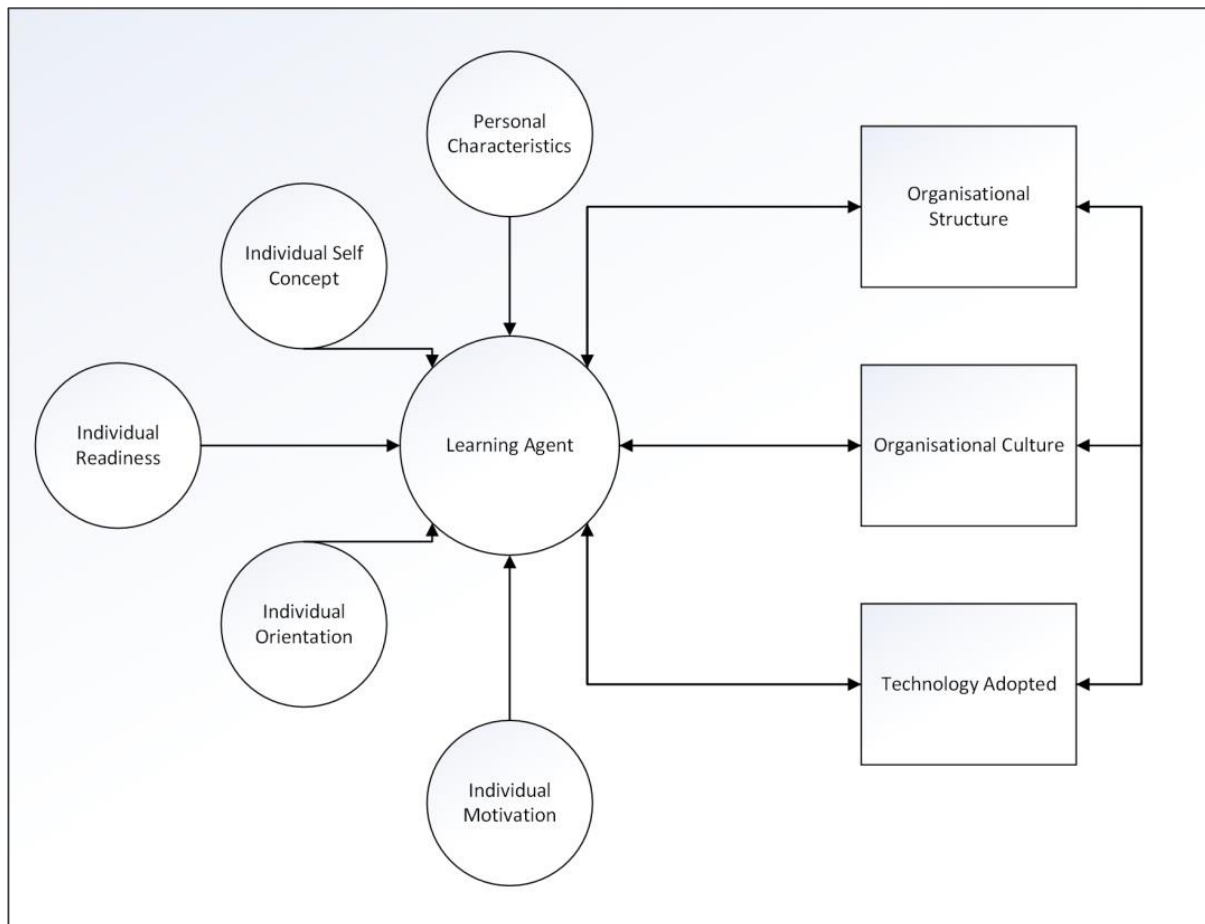


Figure 3-1: A Holistic Analysis of Learning Factors

(Cheong & Tsui, 2011, p. 215)

From the perspective of the organisation, organisational structure outlines the role of individual learning agent; giving a definition of the knowledge they should be obtaining in order to perform the duties at work. Organisational culture defines the terms and contributions of the psychological contract which will serve as governance from which individuals will be expected to contribute their expertise. The technology which is adopted by the organisation provides the crucial working platform in the 21st century digital driven marketplace. If carefully selected and rolled out technology can become the catalyst to facilitate the learning process and help individual learning agents built up their own knowledge bases which can contribute to the corporate data bank, allowing for other learning agents to retrieve and learn from. (Cheong & Tsui, 2011, p. 214)

It is the responsibility of the organisation to have a full understanding of the individual learning factors, such they are in an empowered position to correctly identify which resources are needed to allocated to individual learning agents. These resources can include: time and

money for a particular training programme, rewards to motivate the processes aligned to learning and the contributions required of the learning agents and guidance from supervisors or peers. The provision by the organisation for their human capital assets, will allow the organisation to sustainably develop their talent pool with a focus on every learning agent becoming a manager of their personal knowledge. (Cheong & Tsui, 2011, p. 215)

3.5 Communities of Practice

3.5.1 Introduction

Sandrock (2008), in her book *The Art of Managing Knowledge* introduces the concept of communities of practice (COP) by explaining that individuals are placed in a position whereby they can:

- Collaborate to find solutions to problems,
- Test out new ideas with like-minded colleagues,
- Learn from new developments within their field,
- Build an affiliation with those who share interest in a certain domain of knowledge, (Sandrock, 2008, p. 55).

Sandrock (2008) describes a COP as: a group comprising of a collection of people who focussed on a common interest in a knowledge area, business requirement or core competency, which show a willingness to work together for the tri-benefit which is namely:

- Their own benefit
- The benefit of the community
- The benefit of the organisation (Sandrock, 2008, p. 55)

Etienne Wenger (1998), who is known as one of the founding minds behind the concept of a COP in Michaelides & Kehoe (2008), defines a COP as being a group of individuals who come together in the aim to learn from one another by sharing their unique experiences that shaped their knowledge around a particular field, (Michaelides & Kehoe, 2008).

3.5.2 Three Dimensions of COPs

Sandrock (2008), describes the three dimensions of COPs in Table 3-4 below, namely the; domain, members and community work which forms the basis of the development of a community of practice, (Sandrock, 2008, pp. 55-56).

Table 3-4: Description of the Three Dimensions of COPs

(Sandrock, 2008, pp. 55-56)

Dimension	Description
Domain	This the particular area of expertise, or knowledge base to which the group is working towards developing. It is the common interest that draws the group together.
Community	These are the individuals within the community who work together with a professional and trustworthy manner, towards goals aligned to self, group as well as the organisation. It's believed that the group should comprise of 15-20 members, as if the group becomes too large, individuals may become hesitant to share knowledge.
Practice	The process includes members sharing experiences and knowledges aligned around the discussion and creation of best practices. Together the community work towards solutions to organisational problems and thus grow the collective knowledge base of the entire community.

3.5.3 Roles and Responsibilities in COPs

Sandrock (2008), describes that within a Community of Practice (COP) that their needs to be an identification of the relevant roles and responsibilities for the various members of the community. A summary of the roles and responsibilities are listed below in Table 3-5 below, (Sandrock, 2008, pp. 56-57).

Table 3-5: Description of the Roles and Responsibilities of Members within a COP

(Sandrock, 2008, pp. 56-57)

Role	Responsibility
Leader	The leader is the individual who cares the most about the knowledge domain, thus provides the navigation for the community of practice. The individual is generally an expert in the field, but furthermore has a drive to ensure that the knowledge within the individuals of the organisation becomes embedded in knowledge assets.
Sponsor	A sponsor is generally an individual within the senior management of the organisation. His/her role is to ensure that the community of practice receives high level buy in from other discipline heads as well aligning the

	goals of the community of practice with those of the organisation's strategy.
Facilitator	The role of facilitator is crucial for the community of practice to be a success. With focussed enthusiasm for the development of knowledge, the facilitator is responsible for ensuring the focus of the group.
Information Specialist	Information specialists are crucial to the success of the community of practice due to their experiences in searching for information, as well as their access and training on the use of international databases. Without this external source of information the community of practice will become stale as it concentrates only on the information within the organisation, which is often aligned to the unique and narrow array of experiences of the organisation.
Knowledge workers/experts	The experts of the organisation often have the information requiring to be discussed and capture by the community of practice. Often they enjoy the opportunities to share the experiences and know-how gathered over the years with like-minded individuals willing to learn.
Learners	The learners of the organisation ask questions that often spark conversations to which the experts are able to drive. Without these, often the experts do not know where to start. Additionally by asking and answering questions, a database of FAQ can be developed for the community of practice.

3.5.4 Tri Benefit of COPs

Michaelides and Kehoe (2008), suggest the benefits of COPs are threefold, when viewed from the perspective of the organisation, the community and the member. This tri benefit is elaborated below with the following lists, (Michaelides & Kehoe, 2008, p. 368).

1. Benefits recognised at the organisational level include:
 - a. Reductions in problem solving time, as employees are able to communicate with each other in solving problems collectively. In essence, company experts are more accessible.
 - b. Cross-fertilisation of ideas and increased innovation opportunities. With a community there is an inherent environment from which people can exchange ideas and provide suggestions to colleagues.

- c. Knowledge retention when employees leave the organisation. This is an outcome of sharing of knowledge and as such crucial knowledge is held in more than just a select few minds.
 - d. Providing clarity in terms of collaborative work.
 - e. Developing, recruiting and retaining talent
 - f. Building core capabilities and knowledge competences.
2. Benefits recognised at the collaborative community level:
- a. Assist in the development of a common ground. This could be further refined into specific languages and methods of problem solving.
 - b. Transferring of knowledge and expertise to a greater population.
3. Benefits recognised at the individual member level:
- a. Assisting individuals in completing their work with a greater efficiency.
 - b. Developing learning focussed grouping of minds whose aim is to learn from one another as they solve problems.
 - c. Structure the development of individual skills and competences
 - d. Ensuring that knowledge workers remain current by building on the dialogue presented by the COP.
 - e. There is a share of control and form of the COP by its members.

3.5.5 Knowledge Management Building Blocks

In her book, *The Art of Managing Knowledge*, Sandrock (2008), suggested that when developing a community of practice, the foundation should be built upon a combination of building blocks, namely:

- Information Audits
- Knowledge Mapping
- Building an Expert Locator
- Programmes for Retiring/Retired Experts
- Experts' Presentations and Knowledge Fairs
- Digital Video Tacit Knowledge Fairs

- Storytelling
- Developing Knowledge Products
- Innovation and Idea Logging
- Document Management
- After Action Review
- Stakeholder Relationship Management

Two of these for completeness in line with the results obtained in Chapter Five - Results and Discussions are explained in the sub sections to follow.

3.5.5.1 Expert's Presentations and Knowledge Fairs

Sandrock (2008) suggests that before the idea of expert's presentations and or knowledge fairs are implemented the communities of practices take ownership and nominate the speakers. She also suggests that the organisation considers capturing the presentations in a digital video format as this could further increase the organisational memory. (Sandrock, 2008, p. 32)

The success of an expert's presentation of knowledge can be measured by the attendance at the forums, post presentation requests for the presentation material as well as the overall morale of the presenters' as this can be viewed as a measurement of their recognition levels. As this with all initiatives there is need to understand the potential pitfalls of the forums, and as such the community of practice ensures that the forums are booked at dates and times which allow as many people as possible to attend. Although less obvious, the venue has to be sized strategically for the expected number of attendees. Lastly the presenter's skill in presenting is just as important as the subject content. As such the COP should consider specific training for the SMEs to be equipped to present publically, (Sandrock, 2008, p. 33).

3.5.5.2 After Action Review or Lessons Learnt

Sandrock (2008) suggests that the basis for an after action review or lessons learnt is surrounded by the answering of five key questions following a milestone in a project or program:

- What was meant to happen?
- What actually happen?
- What worked?
- What didn't work
- What should we do differently next time?

An after action reviews success can be measured by the manner in which individuals utilise previous after action reviews such that they can learn from this source of secondary experience. From the perspective of those involved in a after action review, does the overall understanding in the community increase thus providing powerful knowledge resources for others in the organisation to learn from (Sandrock, 2008, p. 47).

Carrilo and Chinowsky (2006), warn that lessons learnt do indeed add to the knowledge base, but are also frequently conducted in a non-systematic manner. On top of this they suggest that often they are conducted without the presence of all of the relevant stakeholders, incomplete recordings of the lessons learnt on site. These culminate in an approach which is often not as well leveraged as it could be, (Carrillo & Chinowsky, 2006, p. 4).

3.5.6 Rewards and Recognition

Sandrock (2008), in *The Art of Managing Knowledge* suggests that within the community of practice, those members who have excelled need to be rewarded and recognised in some shape or form, as this reinforces the efforts made as well as inspires others to continue in the positive culture exhibited. Thus it is imperative that the community leader has an idea of the reward and recognition mechanisms that would form the greatest reinforcing influence on the desired behaviours of the community of practice.

The following is a list of examples:

- Offering a percentage of the savings and or value generated as a result of the efforts of the community of practice.
- Sponsored and or further education opportunities
- Development in a business area of personal preference.
- Time off or perhaps greater flexibility in working hours
- A public mention by the senior management in recognition of the success of the community of practice.

Sandrock believed that that as people move further into the knowledge-based economy, the rewards associated with knowledge sharing will grow in significance when developing individual performance contracts, (Sandrock, 2008, p. 59).

3.6 Personal Knowledge Networks

3.6.1 Knowledge Network

Chatti (2012), explains that the PKN model attempts to address the personal and network dimensions of knowledge. It addresses the explicit as well as the tacit dimension of knowledge and approaches knowledge from a complexity perspective.

PKN is developed to focus on the knowledge worker as the central node and views KM as the constant creation of a personal knowledge network (PKN). A PKN shapes the knowledge identity of the individual knowledge worker. For each knowledge worker, a PKN is a unique adaptive repertoire of:

- Tacit and explicit knowledge nodes
- One's theories-in-use. This includes worldview for individual performance, strategies for achieving goals.

In the PKN model, the aim is to develop an individual's external network of other knowledge workers such that there is a greater access to new tacit and explicit knowledge nodes. These nodes would be both the knowledge workers in the network as well as the resources from which a knowledge worker could utilise, (Chatti, 2012, p. 838)..

3.6.2 Knowledge Ecology

A knowledge ecology forms the environment in which a personal knowledge network thrives. Por (2000) suggests that by definition a knowledge ecology is:

"A field of theory and practice that focusses on a discovering better social, organisational, behavioural and technical conditions for knowledge creation and utilisation," (Por, 2000, p. 2).

In comparison Malhorta (2002) suggests that a knowledge ecology:

"Treats knowledge creation as a dynamic evolutionary process in which knowledge is created and recreated in various context and at various points of time, "(Malhorta, 2002, p. 232).

Chatti (2012), suggests that in comparison to having to blend into a group or a community, each knowledge worker has the ability to manage independently his or her own individual PKN inside a broader network of a knowledge ecology. PKNs can therefore be understood to be the puzzle piece from which knowledge ecologies evolve. Chatti (2012), defines a knowledge ecology as being

“A complex, knowledge intensive landscape that emerges from the bottom-up connection of PKNs,” (Chatti, 2012, p. 837).

Chatti (2012), goes on to described a knowledge ecology as being an excellent illustration of a complex adaptive system. A knowledge ecology is complex in that it is varied and comprises of numerous interconnected components and adaptive in the manner in which it displays the capacity to change and furthermore learn from experience. Knowledge ecology is developed by individuals and is maintained independently of the organisation. In comparison to other learning models, knowledge ecology facilitates the learning that occurs in a bottom-up and emergent manner, instead of traditional learning that functions within top-down and hierarchical structures under the control mechanisms of outside forces, most notably the organisation, (Chatti, 2012, p. 838).

3.7 Conclusion

This chapter reviewed a selection of literature along the concepts of knowledge and knowledge management. It thereafter explained various components of the fields under study inclusive of personal knowledge management, organisational knowledge management, communities of practice and personal knowledge networks.

These theoretical constructs were used in constructing the research instrument as is described in 4.6 Construction of the Research Instrument on page 50.

Chapter Four - Research Design and Methodology

4.1 Introduction

The study was conducted within the Engen Petroleum Production facility, Engen Refinery, in the South of Durban. This chapter focusses on the development of the research design and methodology selected.

4.2 Research Methodology

This section discusses the various methodologies that are employed when conducting research.

4.2.1 Qualitative Research

Denzin and Lincoln (2000), definition from their *Handbook of Qualitative Research* conveys the complexity behind the concept of qualitative research:

“Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them.” (Denzin & Lincoln, 2000, p. 3)

In contrast Cresswell (2007), provides a definition which emphasises the design and use of distinct approaches to enquiry, and as such is focussed on the process required of qualitative research:

“Qualitative research begins with assumptions, a worldview, the possible use of a theoretical lens, and the study of research problems inquiring into the meaning of individuals or groups ascribe to a social or human problem. To study this problem, qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is inductive and establishes patterns and themes. The final written report or presentation includes the voices of the participants, the reflexivity of the researcher, and a complex description and interpretation of the problem, and in extends the literature or signals a call for action,” (Creswell, 2007, p. 37).

Referenced from Creswell, (2007), in Table 4-1, a review of the common characteristics of research are tabulated to which will form the basis of this study.

Table 4-1: Qualitative Research Characteristics

(Creswell, 2007)

Qualitative Research Characteristic	Description
Natural Setting	Researchers utilising a qualitative research method tend to collect their primary data where the participants experience the issue and or problem being studied. As compared to quantitative research, where the instrument could be filled away from the researcher, the data in a qualitative design is obtained in a face-to-face manner.
Researcher as Key Instrument	With qualitative research, the researcher is the primary gatherer of data, with the use of interviews or observing participants over time. They are also generally the primary developer of the research instrument.
Inductive Data Analysis	Qualitative researchers contrive to develop patterns, categories and themes from the “bottom-up.” This inductive process pushes the researcher to work backwards and forwards between the themes and the database.
Participants Meaning	During the qualitative research process, it is crucial that the researcher remains focussed on

	developing the meaning of the participants towards the problem or issue, and not the meaning the researcher or other literature may have.
Emergent Design	The process driving qualitative research is emergent in nature. This means that the initial plan, can and will probably evolve during the various phases of research. The core focus needs to remain that the researcher is aiming to learn about the problem or issue from the viewpoints of the respondents.
Interpretive Inquiry	Qualitative research is a system in which researchers make an interpretation of what they see, hear and comprehend. The researcher's comprehension and interpretation is based on their own background.
Holistic Account	Qualitative researchers attempt to develop complex pictures of understanding of the problem and issue being studied. Researchers are not bound by strict causal relationships, and such are able to identify the complexity of factors coming out from the various perspectives of the participants.

4.2.2 Quantitative Research

Snape and Spencer (2003), explain that quantitative research is focussed on the investigation of the social world in which ways which emulate the scientific method, with an emphasis on hypothesis testing, causal explanations, generalisations and prediction, (Snape & Spencer, 2003, p. 14).

Davies (2007), acknowledges that different to qualitative research methods, quantitative research requires, "imagination, patience and discipline at the planning and design stages." The collection of data may create its own technical issues but often these can be overcome

with tenacity. Lastly the tasks of data analysis and report writing remain largely focussed on the initial step of project set up, (Davies, 2007, p. 26).

4.2.3 Mixed Methods or Triangulation Research

Ritchie (2003) defines mixed methods or triangulation as:

“Involving the use of different methods and sources to check the integrity of, or extend, inferences drawn from the data. There is much debate about whether the value of triangulation is to validate qualitative evidence or lies in extending understanding through the use of multiple research perspectives or different types of reading, often termed as multiple methods,” (Ritchie, 2003, p. 46).

Davies (2007), in his book *Doing a Successful Research Project - Using Qualitative or Quantitative Methods* explains that initially at least the collection of your data in a multimethod or triangulated approach is not particularly problematic. It would be as simple as completing two separate studies, one qualitative and one quantitative. The issues generally arise when you attempt to relate one type of result with the other. His suggestions are to either leave them as separate entities or try and interweave them. He warns though that in selecting between the two a large dosage of judgement, skill and imagination is required to analyse the uniqueness of one's research, (Davies, 2007, p. 205).

4.2.4 Methodology Selected

As mentioned in Creswell (2007) definition, qualitative research hinges on the worldview of the researcher, and as such form the basis of their original stance on the issue being researched. He notes that in particular there are four general worldviews namely; post positivism, social constructivism participatory, and pragmatism, (Creswell, 2007, pp. 20-23). These are summarised in Table 4-2 below.

Table 4-2: Research Worldviews Leading to Selection of Research Methodologies

(Creswell, 2007, pp. 20-23)

Worldview	Description	Qualitative Methodology
Post positivism	Focus on a scientific approach to research. Emphasis on empirical data collection	Grounded Theory Research Phenomenological Research
Social Constructivism	Focus is on the understanding of the world in which we live and work. The goal of this type of research is to rely on the participants view of a situation or problem	Grounded Theory Research Phenomenological Research
Participatory	Use of an alternative approach to post positivism as the structure and laws may not suit the study of marginalises, and the social constructivism methods do not advocate for the action to help these individuals. Focus on an action agenda aimed to reform the lives of the participants.	Ethnographic Research Narrative Research
Pragmatism	There is a focus on the outcomes of the research, the actions, situations and consequences of the inquiry, rather than the prior conditions as emphasised by post positivism.	Ethnographic Research Case Study Research

With all qualitative research it is imperative that the researcher selects a suitable research methodology or approach. Utilising a recognised approach enhances the rigor of the research report produced, (Creswell, 2007, p. 45). For the purpose of the remainder of this study, the

phenomenological research approach was followed, inclusive of the procedures to be outlined in Data Collection Methods on page 49.

As defined by Moustakas (1994) in Cresswell (2007):

“Whereas a narrative study reports the life of a single individual, a phenomenological study describes the meaning from several individuals of their lived experiences of a concept or a phenomenon. Phenomenologists focus on describing what all participants have in common as they experience a phenomenon. The inquirer then collects data from persons who have experienced the phenomenon, and develops a composite description of the essence of the experience for all of the individuals. This description consists of what they experienced, and how they experienced it,” (Moustakas, 1998).

4.3 Sampling

A sample is basically a subset of the entire population (Sekaran & Bougie, 2010). A sample of a population is used to simplify the research, save time, reduce costs and determine detailed properties of the entire population (Brynard & Hanekom, 2006).

There are two broad types of sampling design. These are known as probability sampling and non-probability sampling. With regards to probability sampling, the elements in the population have a known, non-zero possibility of being chosen as sample subjects and in contrast, with non-probability sampling, the elements do not have a known or pre-arranged possibility of being chosen as sample subjects (Sekaran & Bougie, 2010).

Probability sampling is mainly connected to investigation based research where the researcher needs to make deductions from the sample about a population to answer the research questions or to meet the objectives (Saunders, et al., 2003).

In non-probability sampling, the units of the study are systematically or purposefully selected from the population (Maylor & Blackmon, 2005).

There are many different types of sampling techniques that are used for non-probability sampling. These comprise of:

- Convenience sampling - this form of sampling technique entails selecting sample elements that are most readily available to partake in the study and who are able to provide the essential information that is required (Hair, et al., 2003).
- Purposive sampling - this is a non-probability sampling design where the information required is collected from specific targets or groups of people on some rational basis (Sekaran & Bougie, 2010). There are two major types of purposive sampling and these are judgment sampling and quota sampling. “Judgment sampling involves the choice of subjects who are most advantageously placed or in the best position to provide the information required” (Sekaran & Bougie, 2010, p. 277). On the other hand, with regards to quota sampling, the researcher decides on the characteristics that the sample should contain, and then sample until there are sufficient representatives of every category (Maylor & Blackmon, 2005).
- Snowball sampling- this is a non-probability sampling procedure where subsequent participants are referred by the people who are part of the original sample elements (Cooper & Schindler, 2008). The referrals normally have characteristics, attitudes and experiences that are either similar to or different from those of the original sample element (Cooper & Schindler, 2008).
- Self-selection or volunteer sampling - this is a type of non-probability sampling procedure where an individual is allowed to identify a desire to be part of a sample (Saunders, et al., 2003).

Non-probability sampling would be used for the purpose of this research, with a purposive sampling method, using the judgement sampling method as described by (Sekaran & Bougie, 2010).

4.4 Target Population and Respondents

The population of the engineering ACD candidates within the Engen refinery framework totals 50 in number. The study was qualitative in nature and as such a purposive sample was used. As the objectives and research questions align to the leveraging on the available expertise of the company's knowledge base, only engineers who have reached the level of staff engineer or higher were considered as they are each in their own field subject matter experts. As of February 2016 Engen had 16 professionals of this nature which was the proposed sample.

From the 16 TPs approached, 14 responded positively to the request which is an 87.5% response rate. This is indicative of the TPs view on talent development within the organisation, which was a pleasant surprise. From the 14 positive respondents a purposive sampling process was adopted and only candidates from the refinery's process technology skills group (SKG 16.3) were canvassed. Thereafter nine interviews were conducted which ranged in duration from 45 to 90 minutes.

4.5 Data Collection Methods

4.5.1 Data collection/procedure

Data creates the foundation on which conclusions are made (Innovations Insights, 2006). In this regard, it is not only the data types and sources, which determines the success in any research, but also the data collection approach that helps to achieve the required accuracy and reliability.

4.5.2 Primary Data Collection

Data collection must be viewed as a crucial component any type of research study. Inaccurate data collection will have an impact on the results of a study and ultimately lead to invalid results. According to Sekaran & Bougie (2010) there are two methods of primary data collection for research purposes, i.e. Quantitative and Qualitative methods. The quantitative method is objective, the outcome is often known and one uses survey questionnaires (Sekaran & Bougie, 2010). Qualitative research is based on subjective responses, whereby outcomes are not always clear and this methodology is based on the interview research instrument.

For this study the qualitative methods with a phenomenological approach was used. Data was collected from the participants through in-depth interviews, which according to Polkinghorne (1989) in Creswell (2007), should number between 5 and 25, each of which should have first-hand experience of the phenomenon under study, (Creswell, 2007, p. 67). Dukes (1984) recommends that the researcher should pick 3 to 10 participants (Dukes, 1984).

4.5.3 Secondary Data Collection

Creswell (2007) reiterates the perspectives of Marshall and Rossman (2006) by suggesting that before a qualitative study can be completed the researcher needs to review the current literature such that one can begin to develop a rationale for the qualitative research to be conducted, (Creswell, 2007, p. 102).

In this respect, work of other authors' relevant to the study topic of *Engineering Knowledge Management as a Foundation for Capability Development at Engen Refinery*, was considered when drafting questions and objectives. Based on this fact, a number of data sources were consulted including books, journals, newspapers, periodicals and internal company literature. A collection of this secondary data can be found in Chapter Three - Literature Review.

The aim of the secondary data collection component of the research was to focus in on the phenomenon of personal knowledge management, organisational knowledge management and communities of practice and the common experiences of the respondents under study.

4.6 Construction of the Research Instrument

The basic questions covered in the research instrument were derived from Chapter Three - Literature Review, based on the objectives of the study. An informed letter was necessary which aimed to ensure that the respondents are informed of the nature and purpose of the research. An example of the informed consent letter is included Appendix B: Research Instruments. The questions are open ended to allow for responses without predetermined bias. The questionnaire was designed in English, as it was believed that all of the targeted employees are proficient at English. The research instrument is included for reference in Appendix B: Research Instruments. In order to ascertain that all the respondents can completely understand all the questions, the respondents were thoroughly informed of the purpose of the research, such that a context for their response could be ascertained.

4.7 Trustworthiness

As noted by Silverman (2005), trustworthiness or reliability of the research can be enhanced within a piece of qualitative research by employing a variety of tactics. The researcher is required to obtain detailed accounts from the interview process. The interviews need to be first recorded with using a reliable method, and then transcribed verbatim, inclusive of any non-verbal and perhaps trivial components of the dialogue. The coding of the data can be made that much more reliable with the use of a blind coding method, where as far as possible

the coder needs to focus on the themes that develop from the primary data without considering the alignment to the themes found in literature, (Silverman, 2005).

4.8 Credibility

Creswell (2007), in his chapter on Standards of Validation and Evaluation suggests that researchers select at least two of the following procedures, (Creswell, 2007, pp. 207-209):

- Prolonged engagement and persistent observation in the field
- Use of triangulation of research methods
- Peer review
- Negative case analysis
- Clarifying of researcher bias
- Member or participant checking
- Rich, thick descriptions
- External audits

Within this study the data is presented with detailed description for the reader to comprehend the contexts in which the participants' experiences were developed. The entire written analysis in Chapter Five - Results and Discussions has been reviewed by the participants, such that any misinterpretations of the raw data can be replaced with a more concise account.

4.9 Pilot Study

Davies (2007) suggests that a crucial research step to complete following the drafting of the research instrument is to carry out a pilot study. In laymen terms this means that there is a need to try it out on subjects who meet the requirements of your sample. The completion of this exercise in a qualitative research study should allow for a rewarding experience as this a quality assurance step to iterate towards a final research instrument (Davies, 2007, p. 47).

Within the context of this research it was deemed wise to run a small scale pilot in order to gain experience in interviewing and to time the interviews. Three interviews formed the pilot

study. The feedback from these respondents was sought on the interview schedule and its appropriateness. Corrections were made to research instrument where questions were deemed to be vague in nature. These iterations culminated to the final instrument as presented in Appendix B: Research Instruments.

4.10 Ethics Considerations

Weis and Fine (2000) implore that qualitative researchers take cognisance of their roles as insiders to the worldviews of the participant's. These worldviews may contain fears that the participants may have in disclosing. Thus it is important to develop supportive environments during the conducting of the research, as their voices will become the voice of the final study, (Weis & Fine, 2000).

Lipson (1994) groups ethical issues into:

- Informed consent procedures,
- Deception or covert activities,
- Confidentiality towards participants,
- Benefits over risks for participants by involving themselves in the research, (Lipson, 1994)

In this research, the identities of the respondents were protected by the use of pseudonyms. This is outlined in the extract below taken from Appendix B: Research Instruments

“The results of the qualitative interview are aimed to contribute to each of the objectives above aligned to the development of knowledge management strategies within Engen Petroleum Limited. Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this research project. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.”

4.11 Data Analysis

Creswell (2007) provides a step by step phenomenological approach to analysis and representation of representation of data in his book *Qualitative Inquiry and Research Design - Choosing among Five Approaches*, (Creswell, 2007, p. 159). In summary these steps are:

- First describe the personal experiences from the researcher's perspective of the phenomenon being studied. This step is designed to set aside the researchers personal experiences, such that a direct focus can be placed onto the participants in the study.
- From the primary data transcribed the researcher is to develop a list of significant statements, which is aligned to how the participants experienced the topic. This is known as horizontalisation of the data.
- With a focus on the significant statements, the researcher is to group them into larger units of information called meaning units, or themes.
- The researcher shall then write a description of "what" the participants within the study experienced in line with the phenomenon. This is called the "textural description," of the experience and should include verbatim examples from the primary data transcribed.
- Then there is a need to describe "how" the experience happened. This in research terms is called the "structural description." The focus is on the setting and context in which the experience of the phenomenon happened.
- Lastly there is a need to write a composite description which incorporates both the textural and the structural descriptions. This is viewed as providing the essence of the participant's experience and represents the concluding aspect of the phenomenological study.

Cresswell (2007), summarises these steps into a template for coding of phenomenological study in the flow chart Figure 0-1 below, (Creswell, 2007, p. 170). This coding structure will be utilised in analysing the research responses aligned to the research objectives in 5.2 Results on page 57.

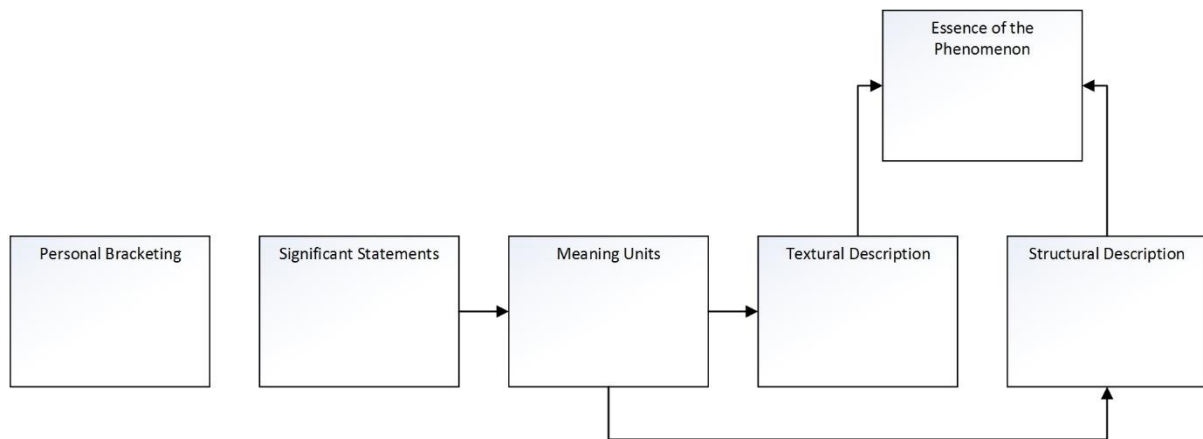


Figure 0-1: Template for Coding a Phenomenological Study

(Creswell, 2007, p. 170)

4.11.1 Shortcomings and Sources of Error

As with all research approaches, phenomenology has its inherited challenges. As described by Creswell (2007), the following challenges should be kept in mind by the researcher:

- The participants within the study were selected carefully as they each needed to have personal experience with the phenomenon under study. This allowed for a common understanding amongst the participants.
- S/he needs to suspend her/his understanding and personal experiences of the phenomenon. This is to ensure that the researcher is filled with curiosity for the opinions of the participants.
- As the interviews need to be conducted on site, the logistics of planning lengthy interviews can be considered another shortcoming of the phenomenological approach, (Creswell, 2007, p. 62).

4.12 Conclusion

The purpose of this chapter was to give the theoretical background of the field research conducted. Aspects such as ethics and piloting were discussed towards the development of the research instrument. The phenomenological methodology was extensively elaborated on, and is the foundation from which the field data collected will be analysed and thereafter discussed in the next chapter, Chapter Five - Results and Discussions.

Chapter Five - Results and Discussions

5.1 Introduction

The purpose of the primary research was to establish amongst Engen's TPs what the level of understanding is of the concepts of personal knowledge management, organisational knowledge management as well as communities of practice. Sandrock (2008), explains the benefits for an organisation to conduct a knowledge management diagnostic survey, such that an understanding of what knowledge the organisation has at its disposal, such that informed leverage can be strategized for. Reinventing the wheel is to be avoided as it can be seen as ignoring the work of your predecessors, which in turn can be viewed as insulting as it could be viewed that the knowledge worker has deemed all previous work to be irrelevant to the development of a knowledge management strategy, (Sandrock, 2008, p. 10).

All the names and identities of the participants have been protected with pseudonyms, and for the purpose of this chapter each response is referenced to these six pseudonyms.

5.2 Results

5.2.1 Demographic and Experience

5.2.1.1 Question 1: For demographic purposes, please could you confirm your gender, ethnicity and age?

The respondents selected were all in the age range from 33-40 years. As the total population's ratio between men and women was 2:1, the sample selected was split 4:2 between men and women respectively. Ethnically within the SKG 16.3 there was a large number of personal being from an Indian background, and this is indicative of the strong dominance of Indian Males in the sample. This demographic statistics of gender, ethnicity and age are tabulated in Table 5-1 below.

Table 5-1: Analysis of Participant's Demographics

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Gender	Ethnicity	Age
Sudhir Lochand	Male	Indian	35
Kumar Naidoo	Male	Indian	40
Kyle Pillay	Male	Indian	34
Ashreya Singh	Female	Indian	33
Sarah Baker	Female	White	37
Brian Jagdeo	Male	Indian	37

5.2.1.2 Question 2: What is your academic background?

As the purposeful sample taken selected the SKG 16.3 group, only engineers who have experience within the Process Technology Group (PTG) participated in the study. Of the 6 participants, 4 had obtained post graduate degrees, 3 of which in a corporate and business role and only one engineering related qualification. The results from the fieldwork are found in Table 5-2 below.

Table 5-2: Participant's Academic Background

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Bachelors Degree	Post Graduate Degree
Sudhir Lochand	BSc Chemical Engineering	MBA
Kumar Naidoo	BSc Chemical Engineering BComm Accounting	
Kyle Pillay	BSc Chemical Engineering	MBA
Ashreya Singh	BEng Chemical Engineering	
Sarah Baker	BSc Chemical Engineering	
Brian Jagdeo	BSc Chemical Engineering	BEng Hon Technology Management

5.2.1.3 Question 3: How long have you been working within the petrochemical industries and with which companies?

Question 3 of the research instrument is an important tool in placing responses in context, and will give insight into the structural description formulation during the phenomenological coding in the open ended questions in the forthcoming sections of the research.

Only two of the participants have had no petrochemical experience outside of Engen. Singh, A started her career at Engen, whilst Lochand S, was previously from the municipal sector. The remaining four participants each had between 1 and 5 years' experience within the industry at other companies where they were in a position to gather skills and knowledge directly related to their current roles at Engen. In Table 5-3 below each participants experience is listed.

Table 5-3: Participant's Petrochemical Experience

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Years of Petrochemical Experience	Companies
Sudhir Lochand	5	Engen (5)
Kumar Naidoo	16	Engen (15) UOP Consultants (1)
Kyle Pillay	11	Sasol (3) Engen (8)
Ashreya Singh	10	Engen (10)
Sarah Baker	14	Engen (9) Foster Wheeler (5)
Brian Jagdeo	9.5	Sasol (1.5) Engen (8)

5.2.1.4 Question 4: Have you had any engineering experience from an industry outside of petrochemical, and if so how would you compare the learning experiences between petrochemical and non-petrochemical industry?

Question 4 is a direct follow on from Question 3 in which the participants were asked to elaborate on their experience outside of the petrochemical industry. The focus was on what skills could have been developed during the participant's careers from opportunities experienced outside of the petrochemical industry. Lochand (2016), Pillay (2016) and Jagdeo (2016) all attribute career defining skill development to their times in the municipality, mining and paper milling industry. Their comments are recorded as significant statements in Table 5-4 below.

Table 5-4: Participant's Non Petrochemical Experience

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Years of Non Petrochemical Experience	Companies	Significant Statements
Sudhir Lochand	10	eThekweni Municipality	In government there was a focus on policy and municipal strategy whilst

			within the petrochemical is more aligned to traditional process engineering and operational support
Kumar Naidoo	None		
Kyle Pillay	3	Mining (2) Paper mill (1)	The mining environment gave me an understanding of the production central role, whilst the paper mill gave me an appreciation for the utilities component of process plants.
Ashreya Singh	None		
Sarah Baker	None		
Brian Jagdeo	6	Mondi	At Mondi I was able to develop fundamental engineering skills inclusive of design, project management and operational support.

5.2.2 Personal Knowledge Management

Questions 5 through 9 are aligned to the concepts of personal knowledge management, and aimed to provide the fieldwork aimed at meeting Objective 1 of this research.

5.2.2.1 Question 5: What do you believe were pivotal goals you achieved on your journey to being an Engen Technical Professional, and how did you go about achieving them?

It was perceived that a goal focus allowed for a forward planning approach towards goal achievement. Whilst analysing the field results the below listed meaning units were established:

- Passion for Learning (Table 5-5)
- Self-Study (Table 5-6)
- Not Goal Focussed (Table 5-7)
- Previous Experience (Table 5-8)

These meaning units were developed from the significant statements tabulated in Tables 5-5 through 5-9 as per the parenthesis in the list above.

From a passion for learning perspective Naidoo (2016) explained that “*Most of this fundamental knowledge was gained as a consequence of my passion, not because someone told me I need to go and learn this or that*, (Naidoo, 2016).” Lochand (2016) reiterates this philosophy by stating: “I was pretty passionate to reach the very top of the profession, as soon as I could,” (Lochand, 2016).

Table 5-5: Meaning Unit - Passion for Learning

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	I am pretty enthusiastic about the field of engineering, as well as management. Effectively this enthusiasm drove me to expand my knowledge at every opportunity.
Kumar Naidoo	Most of this fundamental knowledge was gained as a consequence of my

	passion, not because someone told me I need to go and learn this or that.
Kyle Pillay	
Ashreya Singh	These milestones were rather achieved through the work that I completed or the units I was fortunate enough to work on. Fortunately the department that I was in awarded me this variety of opportunity by virtue of my previous diligence.
Sarah Baker	
Brian Jagdeo	

The meaning unit of passion for learning was endorsed by three of the participants where Lochand stated that:

“I am pretty enthusiastic about the field of engineering, as well as management. Effectively this enthusiasm drove me to expand my knowledge at every opportunity,”
(Lochand, 2016).

Like Lochand (2016), Naidoo (2016) concurred when he considered that passion for learning drove his development.

“Most of this fundamental knowledge was gained as a consequence of my passion, not because someone told me I need to go and learn this or that,” (Naidoo, 2016).

Table 5-6: Meaning Unit - Self Study

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	To do so I ensured that I networked actively, read actively, and attempt to understand new concepts that would help towards my development to grow as a technical professional.
Kumar Naidoo	There is concept called student syndrome, where a person always wants to gain knowledge, but never apply knowledge. Like a teacher has to learn something and then apply it to the school. A teacher always has to be ahead. But if you think of yourself as a student, learning all of the time, which is fine in some instances, then you will only learn as much as someone is willing to teach you, you will not go beyond that. So I saw myself as someone who has studied at university, I have received all of this knowledge, I want to be practical, I want to go and learn for application.

Kyle Pillay	
Ashreya Singh	
Sarah Baker	After my first assessment I had gaps in certain technologies. Through the work I was completing and a lot of actual self-learning I was able to close these gaps ahead of my second assessment.
Brian Jagdeo	I needed just to repeat exercises that I was already competent at, but perhaps had not completed since entering Engen and as such the knowledge specific to the oil and gas industry needed to be proven by virtue of self-study.

The analogy of self-study was a focus of Lochand (2016), Naidoo (2016), Baker (2016) and Jagdeo (2016). Lochand focussed to ensure:

“that I networked actively, read actively, and attempt to understand new concepts that would help towards my development to grow as a technical professional,” (Lochand, 2016).

Baker and Pillay both focussed their self-study on gaps outlined in their ACD assessments. Naidoo presented a contemporary argument of what he thought of the metaphor self-study:

“There is concept called student syndrome, where a person always wants to gain knowledge, but never apply knowledge. Like a teacher has to learn something and then apply it to the school. A teacher always has to be ahead. But if you think of yourself as a student, learning all of the time, which is fine in some instances, then you will only learn as much as someone is willing to teach you, you will not go beyond that. So I saw myself as someone who has studied at university, I have received all of this knowledge, I want to be practical, I want to go and learn for application,” (Naidoo, 2016).

Table 5-7: Meaning Unit - Not Goal Focussed

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	That is a difficult question, I do not know if I had, and this is where I will differ from most of the other engineers. I don't think that I came in with an attitude of this is what I want to achieve.
Kyle Pillay	

Ashreya Singh	This may seem a bit odd or different from other engineers, but I am not as goal orientated as most engineers are normally. I did not set specific goals for myself, saying for instance that I want to be an engineer at a certain age or experience level.
Sarah Baker	
Brian Jagdeo	

Although against the personal bracketing of the researcher, two of the participants (Naidoo and Singh) explicitly stated that they were not goal orientated, with Singh elegantly explaining that:

“I am not as goal orientated as most engineers are normally. I did not set specific goals for myself,” (Singh, 2016).

Table 5-8: Meaning Unit - Previous Experience

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	One of my goals was to bridge the gap between engineering and production, and I managed to do that whilst working on a shift work basis within the mining industry. Whilst I was at Sasol, they were very design focussed, and this helped me develop a solid foundation.
Ashreya Singh	
Sarah Baker	But to answer your question, whilst I was at Foster Wheeler I was fortunate enough to be able to work on water projects, which gave me an extended background from which to build on going into the ACD assessment criteria.
Brian Jagdeo	How did I close the gaps from my baseline assessment to the second TP assessment? I was fortunate that the experience I gained at Mondi was invaluable for this exercise of gap closure.

Three of the four participants whose job history included experience outside of Engen gave reference to their times of employment at other companies as having been very useful in their development towards being a TP at Engen. Baker (2016) in particular explained that:

“...whilst I was at Foster Wheeler I was fortunate enough to be able to work on water projects, which gave me an extended background from which to build on going into the ACD assessment criteria, ” (Baker, 2016).

Thus from these four meaning units the textural and structural description of the responses were constructed. From a textural perspective, the participants had minimal experience of gap closure from the ground up as they entered the system mid-career. From a structural perspective, the participants developed without the structure of the ACD gap closure plan, and instead focussed on intrinsic learning capabilities inclusive of valuable experience gained from other organisations.

These descriptions form into the essence of the phenomenon which was understood to be that technical development needs to be focussed more on exposure and making the most of opportunities of on the job learning and self-study in comparison to classroom training.

The coding structure is summarised graphically in Figure 5-1: Phenomenological Code for Question 5.

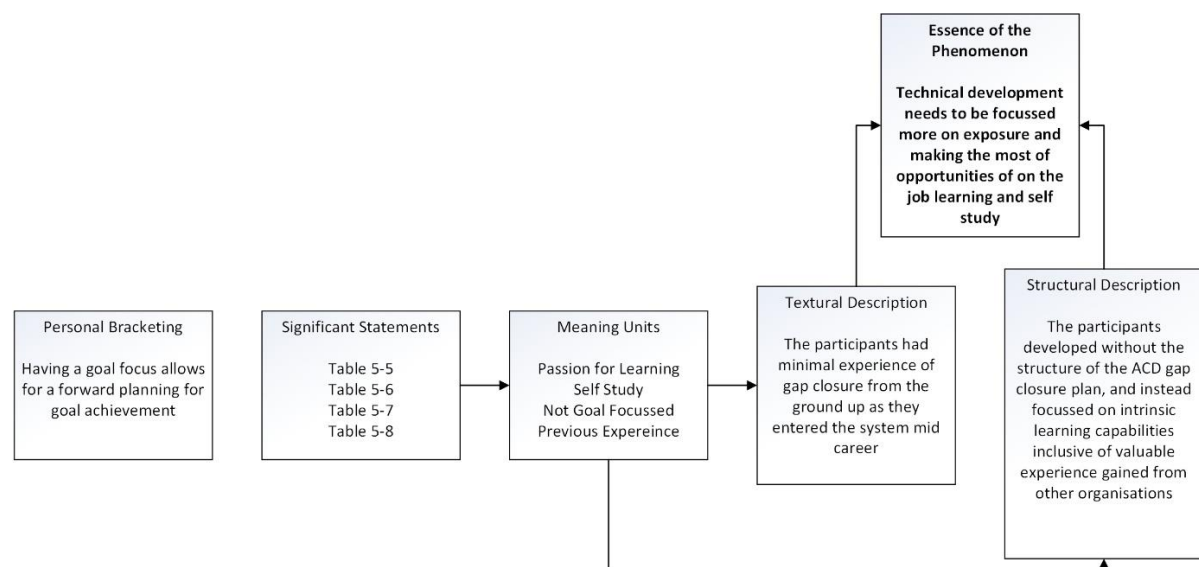


Figure 5-1: Phenomenological Code for Question 5

5.2.2.2 Question 6: What is your understanding of lifelong learning and how do you try and link this concept with the continuous development of your knowledge?

It had been perceived that lifelong learning is crucial, and utilising a multi focussed approach allows for a greater depth in knowledge. Whilst analysing the field results the below listed meaning units were established:

- In Agreement with Lifelong Learning (Table 5-9)
- Continuous Development as an Energiser (Table 5-10)
- Learning from SME (Table 5-Table 5-711)
- Learning from Reading (Table 5-12)

These meaning units were developed from the significant statements tabulated in Tables 5-9 through 5-12 as per the parenthesis in the list above.

Table 5-9: Meaning Unit - In Agreement with Lifelong Learning

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	So I think to stay relevant in life, the day you stop learning you almost become irrelevant, and the way I have seen it. So I am a firm believer, and I read this once some time back that: "what got you to where you are now, will not get you to where you want to be."
Kumar Naidoo	
Kyle Pillay	From the perspective of being a professional engineer, as per ECSA you are required to commit to your continuous learning.
Ashreya Singh	For me this means learning every day. This is not just applicable to work, it is also just as relevant outside of work.
Sarah Baker	There is a need for continuous learning, especially within engineering as your job is constantly evolving with the expansion and demise of technologies across the world.
Brian Jagdeo	In terms of the engineering and technology field, our working environments are always evolving and we need to as engineers stay abreast of the world's continuously rising standards.

Of the six participants, five of them agreed with the notion of lifelong learning, with Brian Jagdeo (2016) stating that:

“In terms of the engineering and technology field, our working environments are always evolving and we need to as engineers stay abreast of the world’s continuously rising standards,” (Jagdeo, 2016).

Further stamping the importance of lifelong learning, Lochand (2016) understood wisely that:

“...the day you stop learning you almost become irrelevant,” (Lochand, 2016).

Table 5-10: Meaning Unit - Continuous Development as an Energiser

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	I spend time trying to master what I already know but I also spend an equal amount of time trying to broaden my knowledge.
Kumar Naidoo	I don't stop learning. I am not only fascinated by engineering, but I am also fascinated by a lot of other things.
Kyle Pillay	I believe that a person should never just be limited to engineering, they should be able to branch out into any field that they may want. I believe that have a diverse world view brings you into a stronger position for the ACD.
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

Further to the concept that lifelong learning is a good quality to have, Lochand (2016) explains that,

“continuous learning is something that I thrive on,” (Lochand, 2016),

In comparison Pillay (2016) notes that,

“a person should never just be limited to engineering, they should be able to branch out into any field that they may want,” (Pillay, 2016).

Both of these statements form the meaning unit of continuous development as an energiser.

Table 5-11: Meaning Unit - Learning from Subject Matter Experts

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	So I engage on quite strongly with people as my primary method of continuous learning. Early in my career I had people who guided and mentored me, thus I was fortunate enough that every arena that I entered, I had someone who I could look up to or could mentor me, and that played a significant role in my development. This was because they would often guide and mentor me directly.
Kumar Naidoo	So I posed the question to the vendor as I believe in sustainability and he told me about this type of vegetation which grows on the surface of a pond which removes the minerals as part of its photosynthesis process.
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

Lochand (2016) and Naidoo (2016) both explained the role of learning from subject matter experts, in particular Lochand (2016) focusses on the foundation of his career where:

“Early in my career I had people who guided and mentored me, thus I was fortunate enough that every arena that I entered, I had someone who I could look up to or could mentor me, and that played a significant role in my development. This was because they would often guide and mentor me directly,” (Lochand, 2016).

Table 5-12: Meaning Unit - Learning from Reading

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	I am a serial reader, so that is something that I am passionate about, both within the oil and gas, and also now within the last few years the general

	business management and economics.
Kumar Naidoo	I like to read things, I don't always have the time to do it, but continuous learning must never be stopped.
Kyle Pillay	
Ashreya Singh	
Sarah Baker	Even if you are only able to read journals this can be enough to stay abreast of developments.
Brian Jagdeo	If you cannot get access to a formal degree, one needs to continuously read journals or watch webinars aligned to your specific industry, which in our case is oil and gas.

Last of the meaning a unit is learning from reading, where Jagdeo (2016) notes it's important for engineers in the industry:

“If you cannot get access to a formal degree, one needs to continuously read journals or watch webinars aligned to your specific industry, which in our case is oil and gas,” (Jagdeo, 2016).

Thus from these four meaning units the textural and structural description of the responses were assembled. From a textural perspective, the concept of lifelong learning has been practiced by each participant. With the structural perspective, a variety of methods have been used based on the circumstanced required of the learning intervention.

These descriptions form into the essence of the phenomenon which is the participants' drive to own their development has resulted in their success in knowledge attainment.

The coding structure is summarised graphically in Figure 5-2: Phenomenological Code for Question 6.

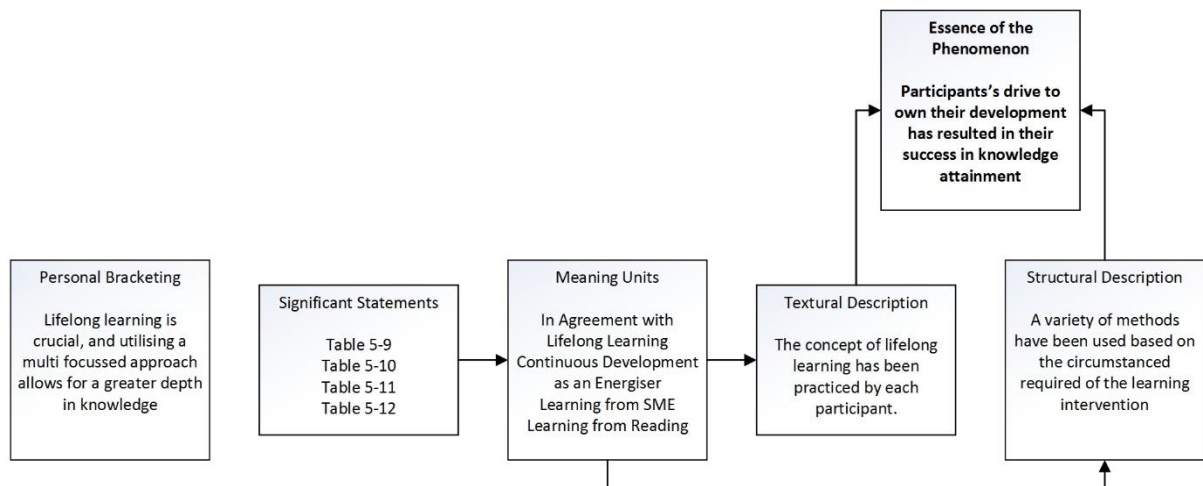


Figure 5-2: Phenomenological Code for Question 6

5.2.2.3 Question 7: Do you believe that there are conflicts of interests or priorities between an individual's goals for self-development and the goals of the organisation, and if so what can an individual do to better align themselves?

From a personal bracketing approach there had been a prior view that the knowledge worker needs to become adaptive to the needs of the organisation on a day to day working basis. The organisation should allow for greater opportunities in external studies. Whilst analysing the field results the below listed meaning units were recognised:

- Acknowledgement of Conflict of Goals (Table 5-13)
- Importance of Mentorship (Table 5-14)
- Non-Linear Development (Table 5-15)
- TM vs TP Development (Table 5-16)
- External Aspirations (Table 5-17)

These meaning units were developed from the significant statements tabulated in Tables 5-13 through 5-17 as per the parenthesis in the list above.

Table 5-13: Meaning Unit - Acknowledgement of Conflict of Goals

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	So at times there will always be a conflict between individual personal goals and organisational knowledge goals. At the onset there is this total disconnect between the two. It is a matter of time before the organisation understands fully your capability.
Kumar Naidoo	In general there are always personal aspirations and there are company requirements. Sometimes the personal aspirations do not align.
Kyle Pillay	Yes there are definitely problems between organisations goals and a person's individual goals.
Ashreya Singh	I definitely believe that these conflicts due exist, as naturally the business will want to position you where they see you would be best for them, and you may not agree with their diligence.
Sarah Baker	As an individual in a place such as this it is quite difficult, as there aren't that many jobs available.

Brian Jagdeo	There always are. You always find young engineers have personal aspirations, which sometimes are not aligned to the business goals
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All six of the participants agreed with the notion with Singh confirming the notion of conflicting goals by stating that she:

“Definitely believe that these conflicts due exist, as naturally the business will want to position you where they see you would be best for them, and you may not agree with their diligence,” (Singh, 2016).

Table 5-14: Meaning Unit - Importance of Mentorship

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	It is important though that we create this alignment, through the existing processes that we do have within the organisation. These include the candidate profiling, the succession planning, and talent development. On every point of this journey the goals of a person need to be aligned to those of the organisation.
Kumar Naidoo	
Kyle Pillay	I am not quite sure how one can address the issue, it is sometimes a good idea to have frequent conversations with your mentor in terms of where you want to go
Ashreya Singh	I would suggest that an individual has sessions with their mentor and or manager as a starting point such that they can have an understanding of your frustration. Together you could be in a position to strategize a way to get closer to a win-win scenario.
Sarah Baker	All you can do is to constantly keep motivating your management to consider changing your roles or responsibilities.
Brian Jagdeo	So in terms of alignment of goals I can't reiterate enough just how important it is to have those discussions with your manager. You need to place your cards on the table, to allow your manager to have an opportunity to take up your request to the relevant committees.

The importance of mentorship meaning unit was mentioned by 5 of the participants, where particularly the view of Lochand (2016) was how the mentor can assist the process of creation of alignment:

“It is important though that we create this alignment, through the existing processes that we do have within the organisation. These include the candidate profiling, the succession planning, and talent development. On every point of this journey the goals of a person need to be aligned to those of the organisation,” (Lochand, 2016).

Table 5-15: Meaning Unit - Non Linear Development Path

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	Often people will talk of being at the right place at the right time, but in actual fact there is a need to be willing to take that opportunity, even it was not within your intended career path.
Kumar Naidoo	So when I was told that I could not go to leadership training, we need you in a technical function, what I did was I went outside and I got myself elected on a body corporate. Eventually I was elected as a chairman. You understand that you don't have to develop at work, development is a life thing.
Kyle Pillay	If this fails however, an individual will need to try bridge their learning gaps on their own. This can be a costly exercise
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	The way I see it, it's a matter of a value add proposition, as rival companies are able to offer better environments for external studies in comparison to us. We are admittedly too restrictive. We need to understand that young people want to study, to uplift themselves and I personally think we need to encourage this behaviour.

The notion of non-linear development is aligned to developing in a manner which is perhaps not traditional in its approach. Jagdeo (2016), makes the comparison to other company's policies on further learning and sums up his views by saying:

“The way I see it, it's a matter of a value add proposition, as rival companies are able to offer better environments for external studies in comparison to us. We are

admittedly too restrictive. We need to understand that young people want to study, to uplift themselves and I personally think we need to encourage this behaviour,” (Jagdeo, 2016).

Naidoo (2016) was the most creative of the participants in the manner that he described his development by taking a position of responsibility in his community:

“So when I was told that I could not go to leadership training, we need you in a technical function, what I did was I went outside and I got myself elected on a body corporate. Eventually I was elected as a chairman. You understand that you don't have to develop at work, development is a life thing,” (Naidoo, 2016).

Table 5-16: Meaning Unit - TM vs TP Development Ladder

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	Now with the ACD system it is pretty clear that you need to become an engineer, senior engineer, staff engineer, and once you are there, there is a fork in the road and you can decide to change to management.
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

Although Naidoo was the only participant who spoke about the variances and complexities of having both a TM and TP progression route, he feels that all too often people focus on the managerial components without commanding the technical first. As he explains:

“It is pretty clear that you need to become an engineer, senior engineer, staff engineer, and once you are there, there is a fork in the road and you can decide to change to management,” (Naidoo, 2016).

The engineer should for their own alignment focus on their technical development before they consider branching off into management.

Table 5-17: Meaning Unit - External Aspirations

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	Unfortunately from the company side, the company has certain business requirements, within managerial structures, you can help a person develop in certain aspects such as leadership and technical for example. But beyond that, I think that it is unfair for the company to be able to meet the person's aspirations.
Kyle Pillay	They may have started their career in engineering, but they could end up wishing to become a business analyst or some other well-paying corporate role. In an instance like this, a company cannot be expected to endorse this

	change of career, for obvious reasons.
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	The general scenario is someone having personal aspirations to study external to the refinery training maps especially when this study is not aligned to the business requirements at this stage.

Naidoo (2016), develops a further argument on the notion of individuals wishing to have aspirations external to those offered in the TP and TM route. He elaborates by saying:

“Unfortunately from the company side, the company has certain business requirements, within managerial structures, you can help a person develop in certain aspects such as leadership and technical for example. But beyond that, I think that it is unfair for the company to be able to meet the person's aspirations,” (Naidoo, 2016).

Thus from these five meaning units the textural and structural description of the responses were assembled. From a textural perspective, the respondents, although acknowledging the challenge of conflicts of goals, still view that with candid conversations with mentors an individual can develop a unique plan towards their knowledge related goals. With the structural perspective, knowledge has empowered the participants. The idea of non-linear development opportunities showed the creative use of every opportunity available for learning.

These descriptions form into the essence of the phenomenon which outlined that the path to the destination needs to be adaptive. Thus the focus of the individual seeking to manage their knowledge must be the ends and not the means.

The coding structure is summarised graphically in Figure 5-3: Phenomenological Code for Question 7

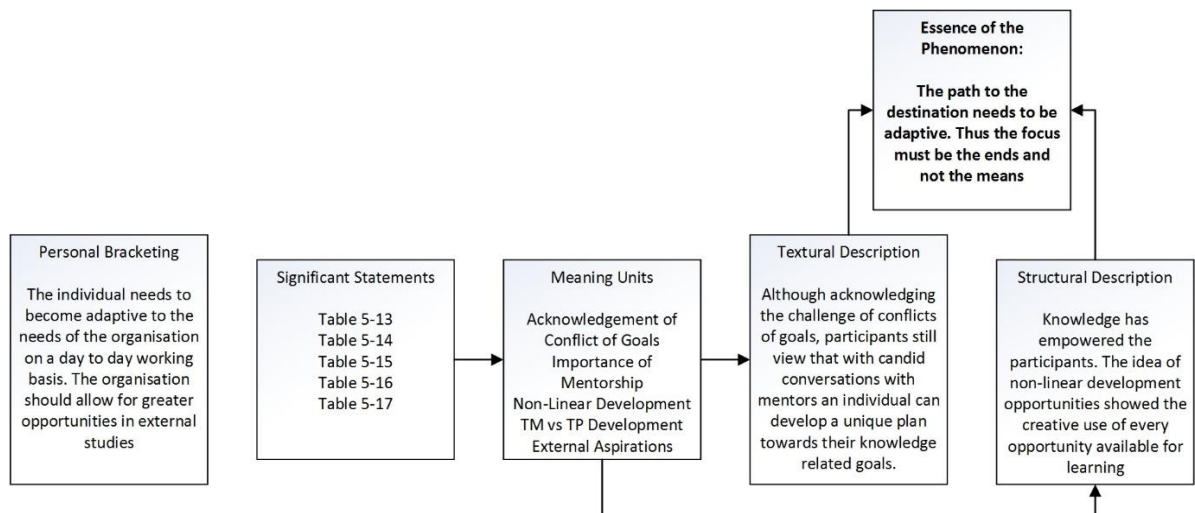


Figure 5-3: Phenomenological Code for Question 7

5.2.2.4 Question 8: What are your thoughts on information overload? How do you, as an individual try to manage information in this knowledge based economy?

It was noted that information could be overbearing in the 21st century social environment when you consider all the digital communication forms, but high quality technical knowledge was still regarded as minimal within our industry. Whilst analysing the field results the below listed meaning units were established:

- Agreement with Communication Overload (Table 5-18)
- Social Media Overload (Table 5-19)
- Disagreement with Engineering Information Overload (Table 5-Table 5-720)
- Information Seeking Skillset (Table 5-21)
- Personal Knowledge Network (Table 5-Table 5-722)

These meaning units were developed from the significant statements tabulated in Tables 5-18 through 5-22 as per the parenthesis in the list above.

Table 5-18: Meaning Unit - Agreement with Communication Information Overload

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	<p>Yes that is true, there is too much information. Most people sit and try and process a large amount of information.</p> <p>I did a self-study once. In a period of three months I received 1100 emails. Out of those 1100 emails, 900 I trashed as it was not applicable to me. I read the other 200 and probably responded to less than a 100. So that means less than 10% of those emails were important to me. It made me realise just how poor the value add is in our current email communication. Thus I am of the view if something urgent or important requires my attention, someone must call me. Even though I don't want to be bombarded by emails, the organisation still does that as they do not understand our perspective. Emails for them is a safety net, they want to throw information at you.</p>

Kyle Pillay	However I do feel that sometimes organisations force too much information down an employee's throat.
Ashreya Singh	There may be a case for information overload when considering the amount of refinery emails we receive which may not directly relate to our business function.
Sarah Baker	
Brian Jagdeo	

Three of the participants acknowledged that there is a form of information overload when they consider the impact of digital communication streams. In particular Singh (2016), suggests that:

“There may be a case for information overload when considering the amount of refinery emails we receive which may not directly relate to our business function,” (Singh, 2016).

Naidoo (2016) explained a self study he completed on the number of emails he received in a 3 month period:

“I did a self-study once. In a period of three months I received 1100 emails. Out of those 1100 emails, 900 I trashed as it was not applicable to me. I read the other 200 and probably responded to less than a 100. So that means less than 10% of those emails were important to me. It made me realise just how poor the value add is in our current email communication. Thus I am of the view if something urgent or important requires my attention, someone must call me,” (Naidoo, 2016).

Although he acknowledges how he would prefer to have a verbal conversation with someone, he does explain via the metaphor of a communication being a safety net that the organisation will most probably not wish to let go of:

“Even though I don't want to be bombarded by emails, the organisation still does that as they do not understand our perspective. Emails for them is a safety net, they want to throw information at you,” (Naidoo, 2016).

Table 5-19: Meaning Unit - Social Media Overload

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	The other thing one needs to be weary of is the amount of time spent on things such as social media. I personally don't waste my time on those types of things.
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

Within this meaning unit, Naidoo (2016) was the only participant who focussed negatively on social media. It's interesting to note that he does not use social media, explaining that he chooses not to:

“Waste my time on those types of things,” (Naidoo, 2016).

Table 5-20: Meaning Unit - Disagree with Engineering Information Overload

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	I don't believe from the strict view of engineering knowledge that we have the issue of more articles becoming available to us. Even if the volume was to increase this would be a sign of strength for the industry.
Ashreya Singh	Thus I wouldn't say that there is an information overload, at least I do not have a sense of information overload. I very rarely feel that I have too much information at my disposal. Normally I have to seek the information.
Sarah Baker	
Brian Jagdeo	I don't think we are at a point, specifically within our engineering spheres of knowledge, that we can claim to be overloaded with information. If anything we as Engen could gain more exposure to current engineering developments.

The concept of an engineering information overload was touched on by three of the participants who explained that there is often a lack of technical information available to the engineers at the refinery. And as Pillay (2016) aptly noted:

“Even if the volume was to increase this would be a sign of strength for the industry,”
(Pillay, 2016).

Jagdeo’s (2016), sentiments were along a similar stream of thought of information availability being proportional to engineering development with the comment of:

“If anything we as Engen could gain more exposure to current engineering developments,” (Jagdeo, 2016).

Table 5-21: Meaning Unit - Information Seeking Skillset

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	I fortunately via the experiences I gained I have learnt where to seek this information, or from whom I should be seeking the information from. This skill set can be quite daunting to new individuals within the organisation, as they may not necessarily know who to speak to with regards to what.
Sarah Baker	
Brian Jagdeo	<p>The refinery specifically had at one stage had a very strong capability to access information, but this has diminished. Our library at one stage had a very strong capability, in terms of being able to access information from the bodies of knowledge. The issue is not simply the lack of dissemination of information, but more the lack of access to journal articles.</p> <p>I think going forward, we could of course do more to make information available, but more importantly I feel we would do well to return to the methodology of having access to these engineering based databases through our library. The organisation really needs to realise that we are in the information era. If I am looking for information, the competitor next door might have this information at their fingertip whilst I need to search; the competitor next door now has a competitive advantage immediately.</p>

Apart from information being made available, the concept of the skill and responsibility of researching for information was touched on by Singh (2016) and Jagdeo (2016). Singh (2016), admitting that she:

“Fortunately via the experiences I gained I have learnt where to seek this information, or from whom I should be seeking the information from,” (Pillay, 2016).

Singh (2016), accepts the personal networking component required, which new employees will naturally struggle with whilst they are still finding their feet within the organisation by stating that:

“This skill set can be quite daunting to new individuals within the organisation, as they may not necessarily know who to speak to with regards to what,” (Pillay, 2016).

Jagdeo (2016) in comparison suggests that the onus should be on the library staff members to be the individuals tasked with researching for information. He recalls a time when he felt the department was stronger by relaying that:

“The refinery specifically had at one stage had a very strong capability to access information, but this has diminished. Our library at one stage had a very strong capability, in terms of being able to access information from the bodies of knowledge. The issue is not simply the lack of dissemination of information, but more the lack of access to journal articles,” (Jagdeo, 2016).

He goes on to explain the competitive advantage information can play in the information era in which we currently operate:

“I think going forward, we could of course do more to make information available, but more importantly I feel we would do well to return to the methodology of having access to these engineering based databases through our library. The organisation really needs to realise that we are in the information era. If I am looking for information, the competitor next door might have this information at their fingertip whilst I need to search; the competitor next door now has a competitive advantage immediately,” (Jagdeo, 2016).

Table 5-22: Meaning Unit - Personal Knowledge Network

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	It is powerful to know who knows what, and developing the network of individuals who can provide the technical support when you as an engineer may require it. The fact that my personal network is as strong as it is, is directly related to the fact that I have been at Engen for 10 years. Relationships cannot be simply developed overnight.
Sarah Baker	
Brian Jagdeo	

The last of the meaning units described by the participants is the notion of a personal knowledge network. As was pointed in the previous meaning unit by Singh (2016), she further reiterates the networking component of information management by stating:

“The fact that my personal network is as strong as it is, is directly related to the fact that I have been at Engen for 10 years. Relationships cannot be simply developed overnight,” (Singh, 2016).

Thus from these five meaning units the textural and structural description of the responses were assembled. From a textural perspective, non-engineering information is overloading the capacity of the participants. There is still a lack of organisational initiated information dissemination. The onus is on the individual to research the information they require. With the structural perspective, emails and other instant communication bombard the participants whilst they struggle to find the engineering knowledge resources crucial for their development.

These descriptions form into the essence of the phenomenon which focussed on the responsibility of individuals to find either the information or SMEs to counteract their knowledge under-load. In contrast filtering is needed from a personal perspective to counteract organisational and social communication overload.

The coding structure is summarised graphically in Figure 5-4: Phenomenological Code for Question 8.

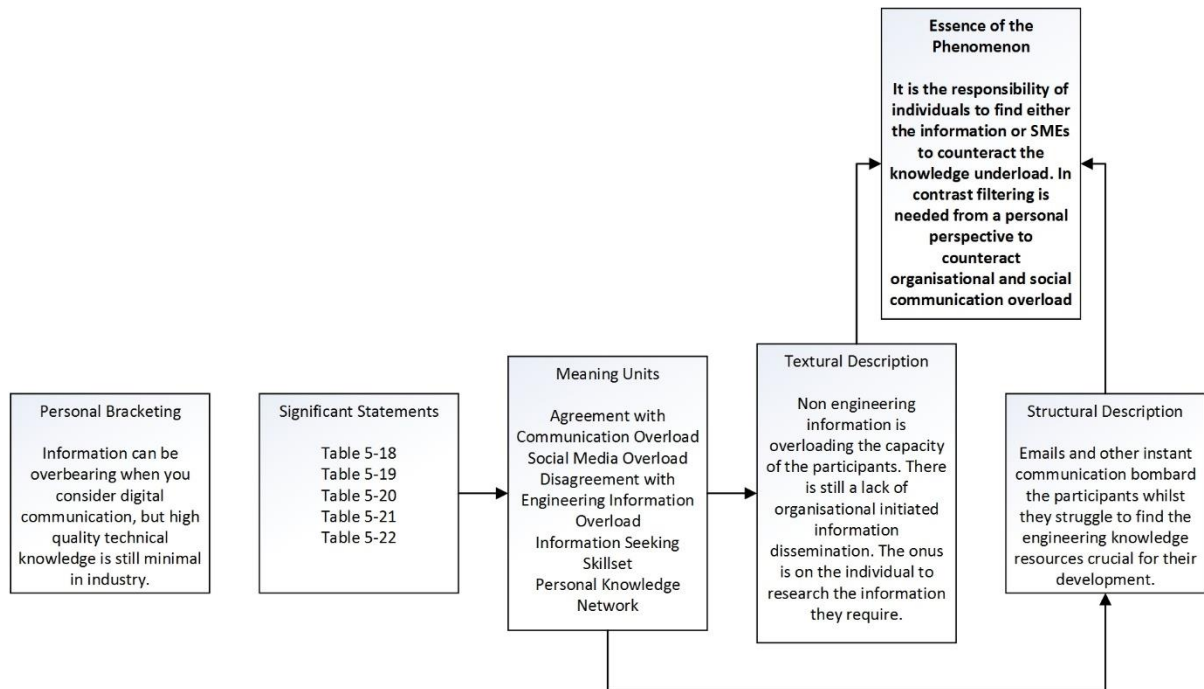


Figure 5-4: Phenomenological Code for Question 8

5.2.3 Objective 1: To Identify the Level of Use of Personal Knowledge Management Strategies within the Engineering Knowledge Workers at Engen.

Objective 1 of the research was discovery in nature, attempting to gain a status quo of the PKM strategies being used within the organisation. Four questions from the research instrument were focussed on this field of knowledge management. The primary data obtained was analysed through a phenomenological approach to reveal the following essences of the phenomenon under study:

- ❖ Technical development needs to be focussed more on exposure and making the most of opportunities of on the job learning and self-study in comparison to classroom training.
- ❖ The participants' drive to own their development has resulted in their success in knowledge attainment.
- ❖ The path to the destination needs to be adaptive. Thus the focus of the individual seeking to manage their knowledge must be the ends and not the means.
- ❖ It is the responsibility of individuals to find either the information or SMEs to counteract their knowledge under-load. In contrast filtering is needed from a personal perspective to counteract organisational and social communication overload.

These findings were conclusive in nature, and revealed that the participants who have all reached the competency level of TP at Engen explained the need of individuals to focus on their role in their own development. On-the-job learning is serendipitous in nature, and as such for the individuals attempting to develop their technical knowledge, allowing for a focus on adaption and reaction to opportunities as and when they arose has proven to be a successful recipe. There was an intense focus on the individuals being able to development PKM skills such as knowledge seeking and filtering in the dichotomy of a world filled with information voids and information overloads.

5.2.4 Organisational Knowledge Management

5.2.4.1 Question 9: What strategies exist to facilitate knowledge management and knowledge transfer within your SKG?

It was evident that within Engen, there are pockets of knowledge management actions, but very little synergistic use of knowledge resources and systems occurs. Whilst analysing the field results the below listed meaning units were established:

- External Training Roadmap (Table 5-23)
- Internal Training Resources (Table 5-24)
- Job Rotation (Table 5- 25)
- Technical Coaching (Table 5-26)

These meaning units were developed from the significant statements tabulated in Tables 5-23 through 5-26 as per the parenthesis in the list above.

Table 5-23: Meaning Unit - External Training Roadmap

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	The guys who developed our ACD system were very knowledgeable in the way in which they develop the system to contain practical training (on the job), mentoring training as well as classroom training. However most people choose to focus on the formal training. People unfortunately view it as a tick box exercise similar to the ones they encountered at university, which was one of my fears when I was first introduced to the system.
Kyle Pillay	From a theoretical perspective, we do try to arrange the relevant external courses for our engineers.
Ashreya Singh	On the job training, technical coaching and class room training, are the traditional components of our developmental framework aligned to the ACD. This is done in the ratio of 70:20:10.
Sarah Baker	We use the IDP (individual development plan) which constructs the timetable from where you will attend external courses.

Brian Jagdeo	The ACD system is based on the 70:20:10 principle, and as such 70% of the learning comes from on the job experience which is best facilitated when paired off with a SME such as a TP or senior engineer. 20% comes from the technical coaching, and 10% comes from formal training.
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Five of the participants spoke of the need and current use of the external training roadmap as a knowledge management strategy within Engen. Jagdeo (2016) explains that:

“The ACD system is based on the 70:20:10 principle, and as such 70% of the learning comes from on the job experience which is best facilitated when paired off with a SME such as a TP or senior engineer. 20% comes from the technical coaching, and 10% comes from formal training,” (Jagdeo, 2016).

Although the system is a sound one, Naidoo (2016) warns that:

“most people choose to focus on the formal training. People unfortunately view it as a tick box exercise similar to the ones they encountered at university, which was one of my fears when I was first introduced to the system,” (Naidoo, 2016).

In the above statement there is an essence of that although on paper the system may help develop engineer’s competencies, the motives behind short-circuiting the system by trying to overemphasise the 10% towards formal training, can be viewed as an attempt to remove responsibility for one’s own development, which is the core 70% taken from the on the job experience.

Table 5-24: Meaning Unit - Internal Training Resources

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	The skills group does provide training with the use of fixed modules that are available on our intranet.
Ashreya Singh	Apart from this we are in the process of developing internal formal training courses within our skills group. Each TP, within their realm of expertise will be rolling out these training presentations aligned to any engineer who may have a particular knowledge gap.

Sarah Baker	
Brian Jagdeo	

Internal training is a route used to facilitate a classroom training environment, but instead of utilising the often costly option of an external vendor, the SKG 16.3 have opted to conduct their own training. This was stated by Pillay (2016) and Singh (2016). Singh explains the role of the TPs in this training by commenting that:

“Each TP, within their realm of expertise will be rolling out these training presentations aligned to any engineer who may have a particular knowledge gap,” (Singh, 2016).

Table 5-25: Meaning Unit - Job Rotation

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	There are also rotational plans for engineers to move department such that skill gaps can be closed holistically. The rotations are generally aligned to a gap identified in the ACD assessment report. Our aim is to always try to rotate two individuals such that neither of their "home," departments are left weaker after the swop.
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	If there is a need for engineers to move between departments, we have implemented a formal hand over process to facilitate the communication of the requirements of the various job roles involved.

The idea of job rotation is often a difficult component to achieve, however with the skills group; it has been used as a KM strategy. Pillay (2016) explains that:

“There are also rotational plans for engineers to move department such that skill gaps can be closed holistically. The rotations are generally aligned to a gap identified in the ACD assessment report,” (Pillay, 2016).

Table 5-26: Meaning Unit - Technical Coaching

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	There is also a form of on the run informal coaching, helping each other solves problems as they arise, thus this knowledge transfer is on a need to know basis.
Sarah Baker	We also are utilising a coaching system, but this systems success depends greatly on the motivation level of both the coached and the coach.
Brian Jagdeo	<p>So technical coaching is basically an initiative that is there to support engineers in closing of knowledge gaps. So it is targeted to aid specifically in closing gaps. The way we do that is by pairing an engineer with a technical coach.</p> <p>Thus the aim is for the individuals to close their gaps whilst simultaneously meeting a business need. We tend to achieve this dual purpose in most instances; it sometimes just requires some forethought.</p> <p>Gap closure is getting better as engineers are beginning to be better prepared. The technical coaching relationships are a major part of this success. As a testament to the program we development, T&D have elected to clone that program with other skills groups. Thus all of the other skills groups’ technical coaching program will be based on our model.</p>

Technical coaching was mentioned as a KM strategy by three of the participants. Jagdeo (2016), introduces the strategy by explaining that:

“technical coaching is basically an initiative that is there to support engineers in closing of knowledge gaps. So it is targeted to aid specifically in closing gaps. The way we do that is by pairing an engineer with a technical coach,” (Jagdeo, 2016).

As it is always important that any knowledge strategy aligns to business needs, Jagdeo (2016) acknowledges and illustrates how this is achieved within the technical coaching program:

“Thus the aim is for the individuals to close their gaps whilst simultaneously meeting a business need. We tend to achieve this dual purpose in most instances; it sometimes just requires some forethought,” (Jagdeo, 2016).

Jagdeo (2016) was proud to conclude that:

“Gap closure is getting better as engineers are beginning to be better prepared. The technical coaching relationships are a major part of this success,” (Jagdeo, 2016).

Baker (2016), although embracing that the system is working, she wearily mentions that the system requires constant motivation:

“this systems success depends greatly on the motivation level of both the coached and the coach,” (Baker, 2016).

Thus from these four meaning units the textural and structural description of the responses were assembled. From a textural perspective, there is strong focus on the role of explicit knowledge resources available. Opportunities for learning are bound by job role, and as such is job rotation is a solution in use. With the structural perspective, the majority of the experiences presented were from the perspective of from the expert for the novice to enjoy.

These descriptions form into the essence of the phenomenon which explained that although there are attempts to introduce knowledge management systems, the success of the system could be throttled if the dual benefit (for learner and expert) is not a focus.

The coding structure is summarised graphically in Figure 5-5: Phenomenological Code for Question 9.

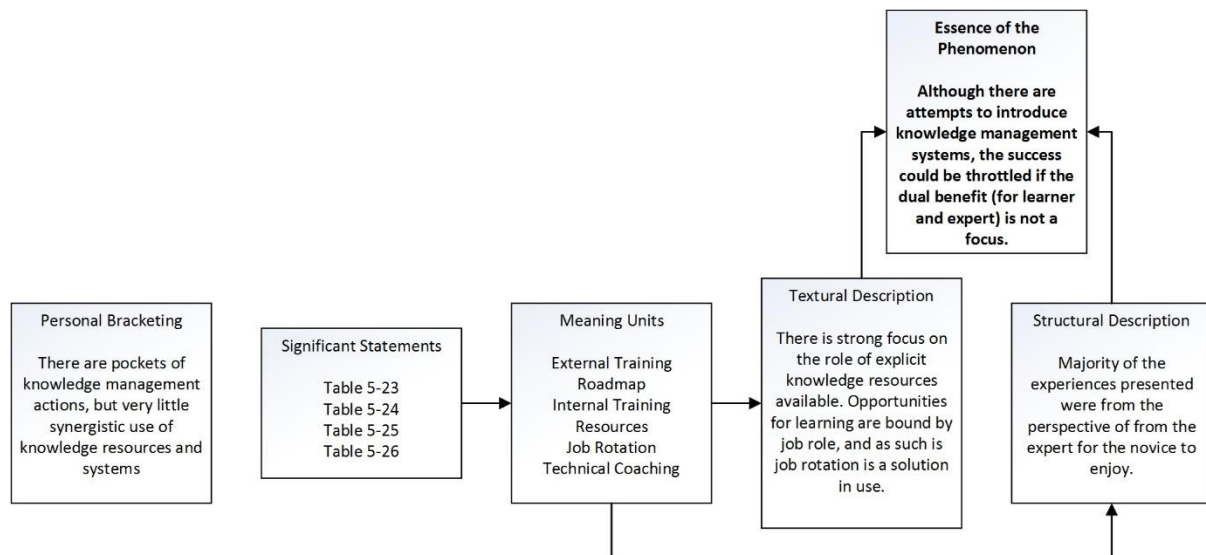


Figure 5-5: Phenomenological Code for Question 9

5.2.4.2 Question 10: What could be possible barriers to knowledge sharing within Engen?

It had been understood that the concept of knowledge is power has been experienced when dealing with certain SMEs. This could be attributed to fear or even possibly personal relationship issues. Although there is an acknowledgement of the problem there is a belief that no blanket solution is viable. Whilst analysing the field results the meaning units of:

- Specialist Mentality (Table 5-27)
- Anti ACD (Table 5-28)
- Racial Divides (Table 5-Table 5-729)
- Explicit Knowledge Capture (Table 5-30)
- High Staff Turnover (Table 5-30)

These meaning units were developed from the significant statements tabulated in Tables 5-27 through 5-30 as per the parenthesis in the list above.

Table 5-27: Meaning Unit - Specialist Mentality

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	People who hold onto their knowledge are power hungry, with the view of being invincible through their knowledge bank. They wish to be the go to person, looking to protect their position and territory within the organisation. Thus these types of people will become a barrier to other people within the same developmental pipeline. This behaviour largely comes from a mind-set of feeling threatened, thinking that other people will develop and surpass their level of expertise, with the potential of replacing them.
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	There are some cases where individuals may have the desire to keep information to themselves, this of course will exist to a certain extent in all companies, but I think it is something that often occurs sub consciously.
Sarah Baker	Often when it comes to other senior engineers, they will push younger engineers away by telling them that they should know this already or that they

	are too busy themselves, when in reality they may simply not have a thorough grasp on the knowledge themselves. Often people see their knowledge as the key to their power, and if they hold all of the relevant knowledge the organisation will not be able to replace them.
Brian Jagdeo	

The meaning unit of specialist mentality as a barrier to knowledge sharing was supported by half of the participants where Baker (2016), suggests that a possible reason for this:

“Often when it comes to other senior engineers, they will push younger engineers away by telling them that they should know this already or that they are too busy themselves, when in reality they may simply not have a thorough grasp on the knowledge themselves,” (Baker, 2016).

Singh (2016), although acknowledging the evidence of these barriers suggests that it may not always be intentional:

“individuals may have the desire to keep information to themselves, this of course will exist to a certain extent in all companies, but I think it is something that often occurs sub consciously,” (Singh, 2016).

Lochand (2016), focusses in on the view that knowledge is power:

“People who hold onto their knowledge are power hungry, with the view of being invincible through their knowledge bank [...] thus these types of people will become a barrier to other people within the same developmental pipeline. This behaviour largely comes from a mind-set of feeling threatened, thinking that other people will develop and surpass their level of expertise, with the potential of replacing them,” (Lochand 2016).

Baker (2016), is aligned to this same view point as she explains:

“Often people see their knowledge as the key to their power, and if they hold all of the relevant knowledge the organisation will not be able to replace them,” (Baker, 2016).

Table 5-28: Meaning Unit - Anti ACD

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
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Sudhir Lochand	
Kumar Naidoo	People will also look for reasons to discredit our development framework as it requires them to prove both their theoretical as well as practical knowledge, which is uncomfortable for most people to develop the required portfolios of evidence.
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

The view point that a barrier to knowledge share could be aligned to the idea that there is a resistance to the ACD program was pointed out by Naidoo (2016), as he suggests:

“People will also look for reasons to discredit our development framework as it requires them to prove both their theoretical as well as practical knowledge,”
(Naidoo, 2016).

Table 5-29: Meaning Unit - Racial Divides

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	I believe that sometimes issues of racial groups surface. Sometimes people believe that they are victims, and other times people believe that they are too smart. Thus based on these preconceptions information flow is halted.
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

Within the social context of a post-apartheid South Africa, it was noted by Pillay (2016), that the racial divides amongst the SKG could be a possible barrier to knowledge sharing:

“Sometimes people believe that they are victims, and other times people believe that they are too smart. Thus based on these preconceptions information flow is halted,” (Pillay, 2016).

Table 5-30: Meaning Unit - Explicit Knowledge Capture

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	I do not believe that the IT systems are easy enough to operate in terms of making the document easy for someone else to search for in the future. Although we may have shared network drives for storage, these are organised very poorly.
Ashreya Singh	The culture at the moment is not to save your work in a network location, which could be of benefit for others, as an example. We need to develop the culture of saving and sharing our information in a network location.
Sarah Baker	
Brian Jagdeo	I do not feel that the mentor mentee approach to knowledge management is not sustainable, as there is no capturing of the knowledge passed down. There is always a need for knowledge to be captured tangibly such that more than just one person can gain.

Three of the six participants felt that the lack of explicit knowledge capture systems was a sore point when considering barriers to knowledge sharing. Singh (2016), argued that:

“The culture at the moment is not to save your work in a network location, which could be of benefit for others, as an example. We need to develop the culture of saving and sharing our information in a network location,” (Singh, 2016).

Table 5-31: Meaning Unit - High Staff Turnover

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	
Sarah Baker	<p>There is also issues aligned to the amount of movement within the refinery, especially from a staff turnover perspective. This in itself is a massive barrier as well. Often the case is someone will arrive at the refinery, learn a lot in three or four years and then leave the organisation, and with their departure a large amount of knowledge leaves with them.</p> <p>Knowledge sharing requires relationships, and this development of relationships is disturbed when people are constantly moving in and out. Often as we are so focussed on production, we do not get the chance to develop the relationships required to facilitate deep knowledge transfer.</p>
Brian Jagdeo	

Although only Baker (2016), focussed in on the issue of high staff turnover from the viewpoint of being a form of barrier to knowledge sharing, her points were deemed to be valid enough to include in an analysis of barriers to knowledge sharing. Initially she spoke of the detrimental effect of having taught someone who then goes on to leave the organisation:

“Often the case is someone will arrive at the refinery, learn a lot in three or four years and then leave the organisation, and with their departure a large amount of knowledge leaves with them,” (Baker, 2016).

With a greater insight Baker (2016), focussed in on the networking component of knowledge sharing, offering it as a possible explanation for the status quo:

“Knowledge sharing requires relationships, and this development of relationships is disturbed when people are constantly moving in and out. Often as we are so focussed on production, we do not get the chance to develop the relationships required to facilitate deep knowledge transfer,” (Baker, 2016).

Thus from these five meaning units the textural and structural description of the responses were assembled. From a textural perspective, the experience of some individuals who were unwilling to share knowledge with others was a strong theme. This was inclusive of capturing the knowledge for others to benefit from. With the structural perspective, the participants experienced individuals who were seeking for validation to not be involved in the ACD and other knowledge related activities suggests. They also experienced the difficulties around knowledge transfer in a high staff turnover environment.

These descriptions form into the essence of the phenomenon which described that the participants experienced people looking for reasons to not be involved in the ACD and other knowledge related activities suggests. They also experienced the difficulties around knowledge transfer in a high staff turnover environment

The coding structure is summarised graphically in Figure 5-6: Phenomenological Code for Question 10.

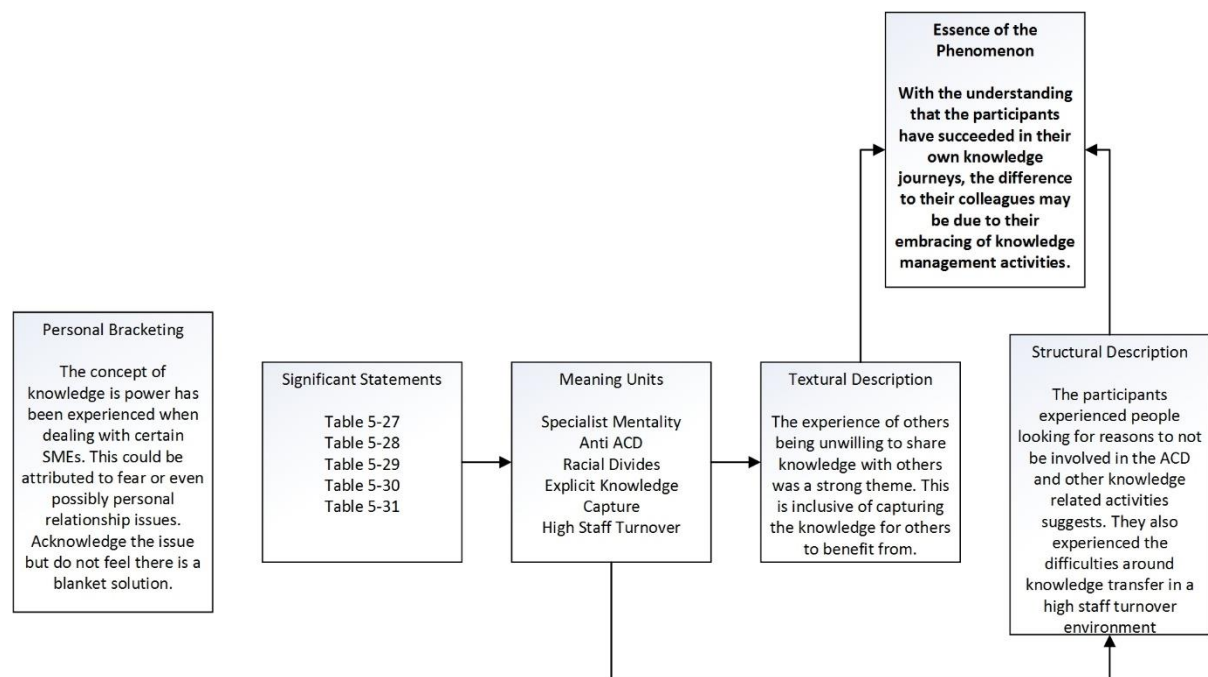


Figure 5-6: Phenomenological Code for Question 10

5.2.4.3 Question 11: What has been your experience of the organisations promotion of you as an individual's quest for personal knowledge?

It was understood prior to the study that the organisation does promote individuals to develop their knowledge within the realm of the ACD. External to the ACD opportunities are harder to come by. Whilst analysing the field results the below listed meaning units were established:

- Leadership Development (Table 5-32)
- Technical Development (Table 5-33)
- Non Supportive (Table 5-Table 5-734)

These meaning units were established from the significant statements tabulated in Tables 5-32 through 5-34 as per the parenthesis in the list above.

Table 5-32: Meaning Unit - Leadership Development

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	They also recognised my passion to develop other people. The company understood this and placed me in charge of the process technology skills group to create alignment between the various goals of the team and the development framework known as the ACD.
Kyle Pillay	
Ashreya Singh	There were also quite a few leadership roles that I was allowed to take on.
Sarah Baker	
Brian Jagdeo	I think from a leadership development perspective I have had quite a bit of responsibility given to me, but in the same breath I often felt that the company carried an inertia with it.

Half of the participants included in their responses to the question that Engen had focussed significant amounts of time and other resources towards their development as leaders within the organisation. In each case the participants confessed that their development was

empowered by a leader in the organisation who was able to develop their competence in this area, either by the organisation who:

“Recognised my passion to develop other people,” (Naidoo, 2016).

Jagdeo (2016), gave a mixed review of the organisations development of himself as a leader when he noted that:

“I think from a leadership development perspective I have had quite a bit of responsibility given to me, but in the same breath I often felt that the company carried an inertia with it,” (Jagdeo, 2016).

Table 5-33: Meaning Unit - Technical Development

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	Additionally early on in my career they identified my capability in the technical field and as such sent me overseas for development.
Kyle Pillay	In terms of technical development, they have made provisions for me to attend international conferences where I was able to mingle with some of the great minds of our industry.
Ashreya Singh	Thus it has mainly been the company who has pushed me to progress through. To achieve this they provided training and the required job rotation.
Sarah Baker	In my time at Engen I have rotated to the Projects department and back a few times, but that is about all of the rotation.
Brian Jagdeo	The organisation has done OK at this, I feel thought that they could of done better. But nonetheless, they have done OK.

Five of the six participants strongly agreed on the meaning unit of technical development. Again Singh (2016), focussed on the role of external individuals who helped her growth when she explained that:

“It has mainly been the company who has pushed me to progress through. To achieve this they provided training and the required job rotation,” (Singh, 2016).

Both Naidoo (2016), and Pillay (2016), spoke of the opportunity of being sent abroad to develop their skillset. This was vital in their development journey which is summarised by Naidoo (2016), when he stated that:

“Additionally early on in my career they identified my capability in the technical field and as such sent me overseas for development,”(Naidoo, 2016).

Table 5-34: Meaning Unit - Non Supportive

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	I do not believe the organisation has been particularly supportive when I consider the personal aspect of my development thus far. When I wanted to study my MBA, the company told me that they do not fund those degrees, and only if you are a manager or have been earmarked to be a manager will they consider paying for your studies.
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

Pillay’s focussed within this meaning unit on a portion of some of his discontent within certain corporate based processes, which Pillay (2016), elaborated on when he describes:

“I do not believe the organisation has been particularly supportive when I consider the personal aspect of my development thus far. When I wanted to study my MBA, the company told me that they do not fund those degrees, and only if you are a manager or have been earmarked to be a manager will they consider paying for your studies,” (Pillay, 2016).

Thus from these three meaning units the textural and structural description of the responses were assembled. From a textural perspective, the organisation will push those who they tag as future leaders to develop the necessary skills. On the technical side each participant agreed that support was given. However with regard to further studies opportunities are not extended to everyone. With the structural perspective, the experiences of the participants were based

on the company supporting them both in terms of technical and leadership development. In terms of further studies company policy was experience as a barrier to entry.

These descriptions form into the essence of the phenomenon which was that the technical elite within Engen, the participants have earned the support they received in terms of technical development. Above this many of them have been placed in positions of leadership and supported with the relevant exposure.

The coding structure is summarised graphically in Figure 5-7: Phenomenological Code for Question 11.

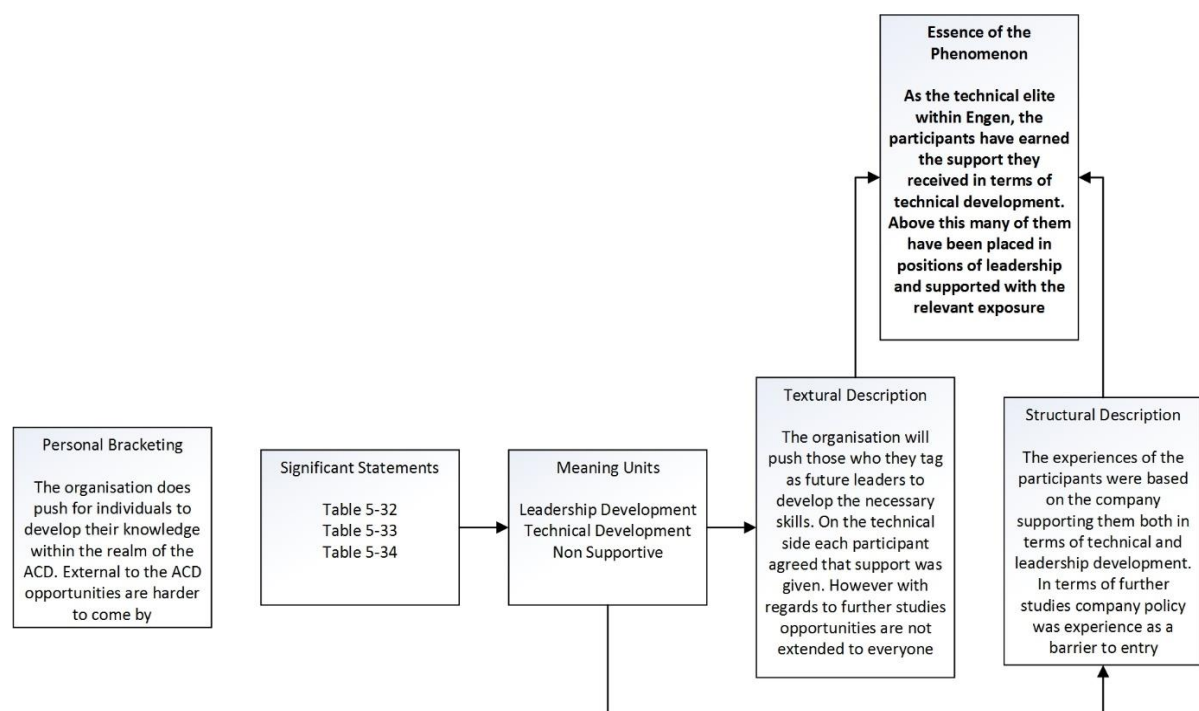


Figure 5-7: Phenomenological Code for Question 11

5.2.4.4 Question 12: What do you believe are links or barriers between someone's personal knowledge management goals and the goals of the organisation? How can the organisation better align these goals?

The organisation should be in a position to constantly analyse the adapting nature of employee's individual goals. Armed with this knowledge unique internal job placement could be a competitive advantage. Whilst analysing the field results the below listed meaning units were established:

- Influential Mentoring and Leadership (Table 5-35)
- Employee Aspirations for Internal Positions (Table 5-36)
- Opportunities for Development and Education (Table 5-Table 5-737)
- Staff Turnover (Table 5-38)

These meaning units were established from the significant statements tabulated in Tables 5-35 through 5-38 as per the parenthesis in the list above.

Table 5-35: Meaning Unit - Influential Mentoring and Leadership

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	The leader has to be the joint. There is always an apparent disconnect, and the question is what are we going to do about this disconnect. This analysis presents the organisation and the human resource as being in a "master-slave," working relationship. But in essence the role of the management or the leadership is to fix this disconnect. And if there is a disconnection, it is as much a measurement of the management, as it is about the organisations poor systems. It is easier to blame a system, as blaming a person can become a personal issue.
Kumar Naidoo	I think a good starting point would be good mentors and good leaders in the organisation. You need mentors because when young people need to have candid discussions to outline both the current state as well as the projected path. This way we can all start to work towards common goals. Then people will begin to trust in the system, instead of simply being forced to comply with a system.

	As a mentor when I look at an individual I do not simply analyse the status quo of the individual but I project where I feel that individual may be able to rise up to. My duty as a mentor or coach is to be able to convert the potential energy the staff has into kinetic energy, such that there is a drive to complete tasks.
Kyle Pillay	We need to have honest discussions, and this is something we do lack as there is a lack of honesty and transparency between employees and their management.
Ashreya Singh	It is important that every engineer has a discussion with their mentor and manager to discuss their job preferences.
Sarah Baker	
Brian Jagdeo	

Four of the participants placed attention in their responses to the meaning unit surrounding influential mentorship and leadership. The views were both on what should be done philosophically as well as the actual experience of the participants either from the perspective of the mentorship that was given or received by them.

Lochand (2016), focussed his view on the belief that philosophically leadership is the joint between individuals and the organisation, across many dimensions, but particularly when one considers the talent development realm of organisational management.

“The leader has to be the joint. There is always an apparent disconnect, and the question is what are we going to do about this disconnect. This analysis presents the organisation and the human resource as being in a "master-slave," working relationship. But in essence the role of the management or the leadership is to fix this disconnect. And if there is a disconnection, it is as much a measurement of the management, as it is about the organisations poor systems. It is easier to blame a system, as blaming a person can become a personal issue,” (Lochand, 2016).

Pillay (2016) continues in a similar vein by suggesting that at Engen currently the discussions between employees and their leaderships are not at the correct relationship level:

“We need to have honest discussions, and this is something we do lack as there is a lack of honesty and transparency between employees and their management,” (Pillay).

This candid style of conversation was further reinforced by Naidoo (2016), who explains that:

“A good starting point would be good mentors and good leaders in the organisation. You need mentors because when young people need to have candid discussions to outline both the current state as well as the projected path. This way we can all start to work towards common goals. Then people will begin to trust in the system, instead of simply being forced to comply with a system,” (Naidoo, 2016).

Naidoo (2016) goes on to explain his experience as a mentor within the organisation:

“As a mentor when I look at an individual I do not simply analyse the status quo of the individual but I project where I feel that individual may be able to rise up to. My duty as a mentor or coach is to be able to convert the potential energy the staff has into kinetic energy, such that there is a drive to complete tasks,” (Naidoo, 2016).

Table 5-36: Meaning Unit - Employee Aspirations for Internal Positions

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	I think here at Engen we are stuck in the worldview of being able to know what we want people to do, and then expecting everyone to conform to this worldview.
Ashreya Singh	It is important that people have an understanding that the organisation has a plan for them and that the organisation has listened to their hopes and aspirations and that they do take these into consideration.
Sarah Baker	I do believe that the organisation should be conscious of the desires of individuals as often positions and opportunities arise that are perhaps outsourced where someone within the company could of have already indicated a desire to transform themselves into that particular role or field of knowledge.
Brian Jagdeo	

Baker (2016), began her explanation by stating that:

“I do believe that the organisation should be conscious of the desires of individuals as often positions and opportunities arise that are perhaps outsourced where someone within the company could of have already indicated a desire to transform themselves into that particular role or field of knowledge,” (Baker, 2016).

These comments are reiterated by Pillay (2016), as he suggests that the organisation often is trapped within a worldview of always knowing what is right for individuals.

“I think here at Engen we are stuck in the worldview of being able to know what we want people to do, and then expecting everyone to conform to this worldview,” (Pillay, 2016).

In comparison Singh (2016), argues that it is crucial that individuals remain focussed on the fact that the organisation does have their interests at heart.

“It is important that people have an understanding that the organisation has a plan for them and that the organisation has listened to their hopes and aspirations and that they do take these into consideration,” (Singh, 2016).

Table 5-37: Meaning Unit - Opportunities for Development and Education

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	From an organisational perspective their needs to be more candour in terms of how to get onto the Engen High Potential list, such that more people have an understanding of the requirements for and the methodologies aligned to selection. Other companies are quick to publish who they believe are on their top 10 performers list. This could then align to a process for selection for further education amongst other business related opportunities.
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	Often a company may feel that if we up skill to far people can become too marketable and may leave for apparent greener pastures, but at the same time, you also should be wanting to up skill your labour or more politically correct

	<p>your human capital.</p> <p>And if you choose to not up skill your people, you lose a significant competitive advantage. And that understanding at Engen needs to be rehashed.</p> <p>When I was at Sasol, they were actively encouraging people to complete an MBA, they would pay for the tuitions fees, and they would give you the time off required to attend lectures. When I was there my manager asked me whether they could help me get into a MBA program at that stage, the question was asked "what can we do for you." I didn't need to ask, instead my manager at that stage approached me twice with this request.</p>
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Jagdeo (2016), was of the view that up skilling of staff has long term benefits for the organisation even despite them becoming more marketable in the process:

“Often a company may feel that if we up skill to far people can become too marketable and may leave for apparent greener pastures, but at the same time, you also should be wanting to up skill your labour or more politically correct your human capital. And if you choose to not up skill your people, you lose a significant competitive advantage. And that understanding at Engen needs to be rehashed,” (Jagdeo, 2016).

The selection criteria towards being considered for external studies was an issue presented by Pillay (2016):

“From an organisational perspective their needs to be more candour in terms of how to get onto the Engen High Potential list, such that more people have an understanding of the requirements for and the methodologies aligned to selection,” (Pillay, 2016).

Along the same concept, Jagdeo (2016), reminisced about some of the comparatively more supportive experiences he had had whilst working for one of Engen’s competitors:

“When I was at Sasol, they were actively encouraging people to complete an MBA, they would pay for the tuitions fees, and they would give you the time off required to attend lectures. When I was there my manager asked me whether they could help me get into a MBA program at that stage, the question was asked "what can we do for

you." I didn't need to ask, instead my manager at that stage approached me twice with this request," (Jagdeo, 2016).

Table 5-38: Meaning Unit - Staff Turnover

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	<p>Retention at Engen is pretty poor. I can recall, in the process technology group, over twelve engineers have left in the last three years, six in the last eighteen months. So the rate is pretty constant and alarming. Generally it is the engineers within the three to five years of experience bracket which are most susceptible to move to other companies. From a bell curve perspective they make up the major component which sits between the graduate engineers and our senior engineers.</p> <p>It is quite frustrating to see the issues aligned to retention but not being able to directly influence these factors as a manager.</p>

Although Jagdeo (2016), was the only participant who developed the meaning unit of high staff turnover his experiences explain the frustrations of a changing workforce and the impact it has on the collective organisational knowledge being developed:

“Retention at Engen is pretty poor. I can recall, in the process technology group, over twelve engineers have left in the last three years, six in the last eighteen months. So the rate is pretty constant and alarming. Generally it is the engineers within the three to five years of experience bracket which are most susceptible to move to other companies. From a bell curve perspective they make up the major component which sits between the graduate engineers and our senior engineers. It is quite frustrating to see the issues aligned to retention but not being able to directly influence these factors as a manager,” (Jagdeo, 2016).

Thus from these four meaning units the textural and structural description of the responses were assembled. From a textural perspective, having candid conversations between knowledge workers and their leaders can help create a more aligned staff body. This would open up new avenues in terms of employee movement within the organisation as well as opportunities for study which are both retention strategies. With the structural perspective, in some instances there is an experience of quality mentorship and leadership being the joint between knowledge worker and the organisation. In others where leadership is lacking can be drawn to the high staff turnover rate.

These descriptions form into the essence of the phenomenon which explained in review the understanding is that great leadership is the catalyst towards the alignment of knowledge related goals. Where the level of leadership is high the alignment is great and the staff are generally satisfied. Where it is not the department can reduce in functionality.

The coding structure is summarised graphically in Figure 5-8: Phenomenological Code for Question 12.

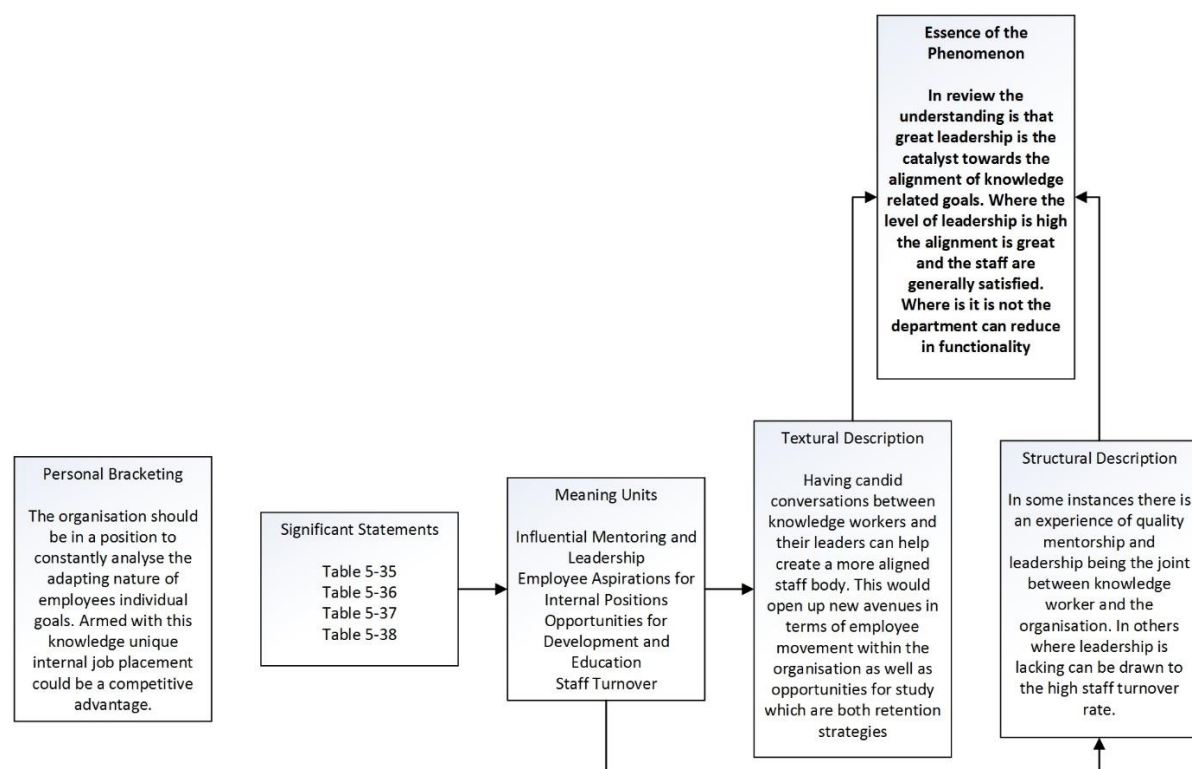


Figure 5-8: Phenomenological Code for Question 12

5.2.5 Objective 2: Gain an Understanding of the Impact of Organisational Knowledge Management Strategies within Engen.

Objective 2 of the research was discovery in nature, attempting to gain an understanding of the OKM methodologies being used within the organisation. Four questions from the research instrument were focussed on this field of knowledge management. The primary data obtained was analysed through a phenomenological approach to reveal the following essences of the phenomenon under study:

- ❖ Although there have been attempts to introduce knowledge management systems, the success of the system could be throttled if the dual benefit (for learner and expert) is not a focus.
- ❖ The participants experienced people looking for reasons to not be involved in the ACD and other knowledge related activities suggests. They also experienced the difficulties around knowledge transfer in a high staff turnover environment
- ❖ The technical elite within Engen, the participants have earned the support they received in terms of technical development. Above this many of them have been placed in positions of leadership and supported with the relevant exposure.
- ❖ The understanding is that great leadership is the catalyst towards the alignment of knowledge related goals. Where the level of leadership is high the alignment is great and the staffs are generally satisfied. Where it is not the department can reduce in functionality.

These findings based on the primary data collected have outlined that there are informal OKM strategies in certain groupings within Engen. The benefits of these have been isolated and many barriers of knowledge sharing were outlined with a focus on individual's alignment to their role in OKM goals. The alignment of the organisation's and the various knowledge workers' knowledge goals were justified as being one of the greatest tasks of the leadership within the organisation. As being the technically gifted of the company, the participants explained their experiences of being both the led as well as the leaders of the organisation, commending the support received from the organisation's leaders on their journey to their current level of knowledge expertise. This provides a template from which a OKM strategy can be developed to match the Engen knowledge environment.

5.2.6 Communities of Practice

5.2.6.1 Question 13: What aspects do you believe would form part of the tri-benefit of communities of practice for individuals, the community as well as Engen overall?

It was perceived that a fully functional COP would bring the benefits of gap closure for an individual as they work in a community to solve every day problems. Thus the individual would develop, allowing them to share with others, and the organisation would benefit from the reduction in reliance on external knowledge resources. Whilst analysing the field results the below listed meaning units were established:

- Semi-Structure Approach (Table 5-39)
- Sharing of Knowledge (Table 5-40)
- Interaction between Like-Minded People (Table 5-Table 5-741)
- ACD Gap Closure (Table 5-42)
- Creative Thinking (Table 5-43)
- Problem Solving (Table 5-44)

These meaning units were developed from the significant statements tabulated in Tables 5-39 through 5-44 as per the parenthesis in the list above.

Table 5-39: Meaning Unit - Semi Structure Approach

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	The community of practice concept is an exceptionally powerful one, the simple reason being that it is a very relaxed but structured approach to ensuring that knowledge is shared. It is not mandatory, but it provides a platform for those who initially are willing to participate in the community and grow their knowledge.
Kumar Naidoo	
Kyle Pillay	

Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

From the research conducted only one respondent stated that a semi-structured approach is required for the development of a COP. Lochand (2016), explains that the:

“The community of practice concept is an exceptionally powerful one, the simple reason being that it is a very relaxed but structured approach to ensuring that knowledge is shared. It is not mandatory, but it provides a platform for those who initially are willing to participate in the community and grow their knowledge,” (Lochand, 2016).

Table 5-40: Meaning Unit - Sharing of Knowledge

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	What a COP is able to achieve is allow a professional to be removed from the traditional academic style of learning theory only, to allowing the individual to share in most cases a case study or how he applied the theory, or what he believes is a challenge with the theory and how he goes about applying these concepts in practice. Benefits include the fact that committed individuals will continue to grow by learning from the experiences shared from the more seasoned individuals.
Kumar Naidoo	A community of practice would definitely be of benefit to us, as individuals as when you are around a team and are talking to people, you are exchanging knowledge.
Kyle Pillay	The advantages would be the dissemination of the knowledge, would help the sustainability of an organisation if a knowledge worker was to leave the organisation.
Ashreya Singh	
Sarah Baker	A community of practice could be a solution to the normal silo mentality, but would be best suited to certain departments. An example could be our projects department sharing lessons learnt amongst the other engineers.
Brian Jagdeo	I think they benefit the organisation as they would facilitate opportunities for

	<p>knowledge sharing in the community.</p> <p>Immediately we will see the benefits in terms of individuals sharing knowledge, the shared knowledge between a group of people and hopefully some sort of benefit for the organisation in the application of the new knowledge.</p>
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The meaning unit of sharing of knowledge was a shared train of thought by five of the six participants. Both Lochand (2016) and Jagdeo (2016) made mention of the sharing of knowledge would benefit both the individual and the organisation within a COP:

“What a COP is able to achieve is allow a professional to be removed from the traditional academic style of learning theory only, to allowing the individual to share in most cases a case study or how he applied the theory, or what he believes is a challenge with the theory and how he goes about applying these concepts in practice,” (Lochand, 2016).

“Immediately we will see the benefits in terms of individuals sharing knowledge, the shared knowledge between a group of people and hopefully some sort of benefit for the organisation in the application of the new knowledge,” (Jagdeo, 2016).

The benefit of knowledge sustainability following the dissemination within the COP was raised by Pillay (2016):

“The advantages would be the dissemination of the knowledge, would help the sustainability of an organisation if a knowledge worker was to leave the organisation,” (Pillay, 2016).

Baker (2016), suggested that the sharing of knowledge would form an integral part of solving the traditional silo mentality within the organisation, but warned against it being a blanket solution:

“A community of practice could be a solution to the normal silo mentality, but would be best suited to certain departments. An example could be our projects department sharing lessons learnt amongst the other engineers,” (Baker, 2016).

Table 5-41: Meaning Unit - Interaction between Like Minded Individuals

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	<p>The COP is derived from a combination of like-minded people who are willing to share their experiences, allowing others to learn from both their successes as well as failures.</p> <p>The whole basis of COP as being a meeting of minds, to provide a platform for the sharing of experiences, and openly discuss ideas outside of the structured organisational chart style working environment.</p>
Kumar Naidoo	There is also the benefit of being able to communicate with the same language with colleagues; there is this intrinsic understanding amongst like-minded individuals.
Kyle Pillay	It should hopefully build relationships between people, whilst they are sharing knowledge amongst themselves.
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	I think COPs are nice structured ways to getting people to interact who think along the same lines..

Lochand (2016) and Pillay both began explaining their views on the importance of a COP facilitating the interaction between like-minded people by stating:

“The COP is derived from a combination of like-minded people who are willing to share their experiences, allowing others to learn from both their successes as well as failures,” (Lochand, 2016).

“It should hopefully build relationships between people, whilst they are sharing knowledge amongst themselves,” (Pillay, 2016).

The relatable technical language of the community was brought to the table by Naidoo (2016), as a further benefit of a meeting of like-minded individuals. Lochand (2016), further explains the meeting of minds metaphor, whereby holistic knowledge sharing occurs without the constraints of the traditional organisational structure:

“There is also the benefit of being able to communicate with the same language with colleagues, there is this intrinsic understanding amongst like-minded individuals,” (Naidoo, 2016)

“The whole basis of COP as being a meeting of minds, to provide a platform for the sharing of experiences, and openly discuss ideas outside of the structured organisational chart style working environment,” (Lochand, 2016).

Table 5-42: Meaning Unit - ACD Gap Closure

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	A COP allows for the filling of gaps created in the knowledge obtained from only theoretical sources as well as that information obtained directly from the mentoring subject matter experts.
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	I believe that from an individual perspective we would find that people would close their ACD gaps at a greater rate.
Sarah Baker	
Brian Jagdeo	

A benefit from an individual perspective was outlined by Singh (2016), when she explained how that there should be an increased rate of gap closure as an outcome of the COP.

“I believe that from an individual perspective we would find that people would close their ACD gaps at a greater rate,” (Singh, 2016).

Table 5-43: Meaning Unit - Creative Thinking

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	Seasoned individuals are fed by the thought provoking questions of the younger COP members.
Kumar Naidoo	The community of practice is an opportunity for those within the community to refresh their learning as questions are posed to the quorum. Once this refreshing has happened enough, an individual can reach the level of what is

	known as creative thinking. Creative thinking is beyond the knowledge of what you have learnt, it is about making new connections between various pieces of information.
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

Naidoo (2016), focussed on the processes towards creative thinking within a COP:

“The community of practice is an opportunity for those within the community to refresh their learning as questions are posed to the quorum. Once this refreshing has happened enough, an individual can reach the level of what is known as creative thinking. Creative thinking is beyond the knowledge of what you have learnt, it is about making new connections between various pieces of information,” (Naidoo, 2016).

Table 5-44: Meaning Unit - Problem Solving

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	The organisation benefits from the fact that their human capital begin to have a common understand of the solutions steps of various disciplines.
Kumar Naidoo	The easiest way to learn is to learn from others, and as such this reduction in the time to competency is a great benefit to the organisation. I believe that it benefits the community at large is benefitted by the fact that when you collect intelligent people into a room to discuss an issue, there is room for them to become innovative and feed off each other's ideas.
Kyle Pillay	It should also improve the way in which this facility is run as we would via the community of practice be able to share best practices with the group, as opposed to just one subject matter expert understanding the complexity of a certain task.
Ashreya Singh	
Sarah Baker	I think an outcome of our traditional mode of problem solving is we do not know what everyone else knows, and or has experienced and as such are often

	destined to repeat each other's mistakes.
Brian Jagdeo	

The analogy that employees of an organisation often are unsure of who knows what was mentioned by Baker (2016):

“I think an outcome of our traditional mode of problem solving is we do not know what everyone else knows, and or has experienced and as such are often destined to repeat each other's mistakes,” (Baker, 2016).

Once the knowledgeable people within an organisation are known by individuals it will become easier to develop their own knowledge by seeking the required technical coaching. Naidoo (2016) explained this benefit when he stated:

“The easiest way to learn is to learn from others, and as such this reduction in the time to competency is a great benefit to the organisation. I believe that it benefits the community at large is benefitted by the fact that when you collect intelligent people into a room to discuss an issue, there is room for them to become innovative and feed off each other's ideas,” (Naidoo, 2016).

Thus from these six meaning units the textural and structural description of the responses were assembled. From a textural perspective, the focus was on a community which thrived on volunteering of time and knowledge. This allowed people to give the optimum to the COP. In this way a holistic knowledge gap would close, utilising the seemingly serendipitous learning opportunities afforded by shared problem solving. With the structural perspective, the experience of informal group sharing and problem solving have occurred, but the common there is a belief that if a COP was to form these benefits would be more consistently applied as more individuals are involved than at present.

These descriptions form into the essence of the phenomenon which was that a COP structure has not been implemented within Engen, but there was consensus in terms of the hope that the collection of like-minded people would indeed bring an increase in knowledge transfer and rate in which technical related problems would be solved.

The coding structure is summarised graphically in Figure 5-9: Phenomenological Code for Question 13.

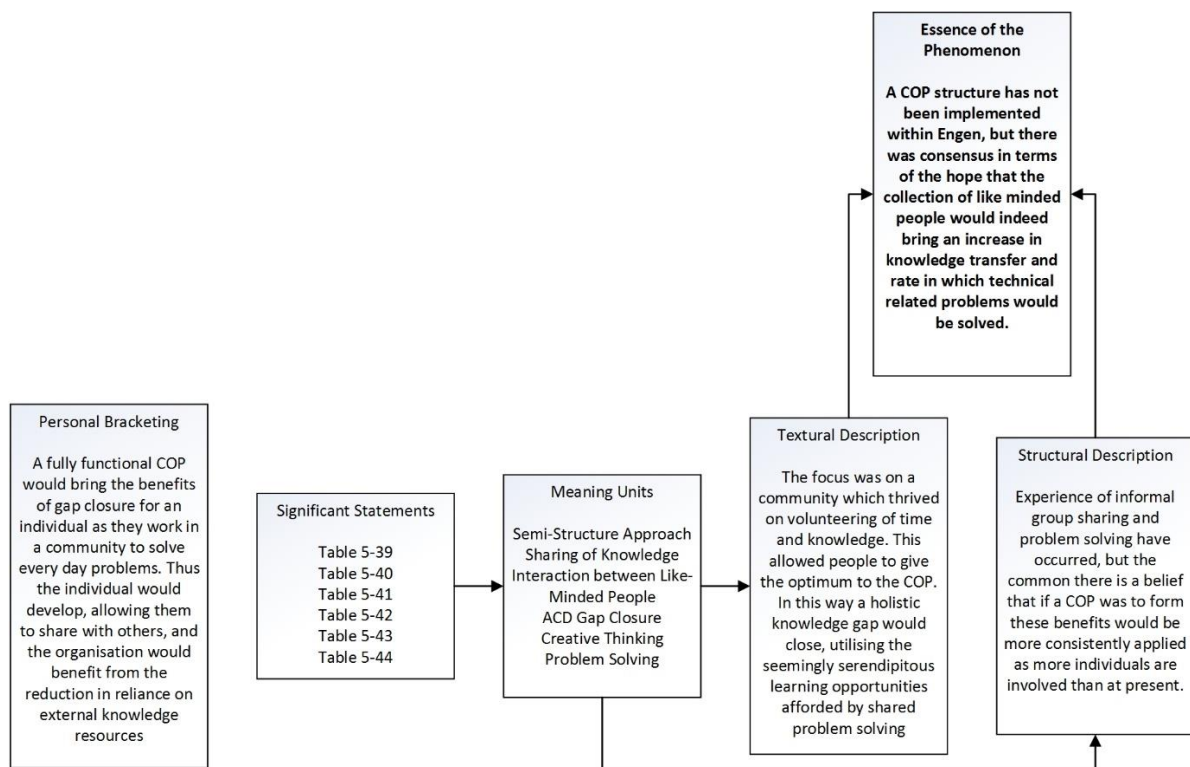


Figure 5-9: Phenomenological Code for Question 13

5.2.6.2 Question 14: How would you structure a community of practice to be aligned to engineering capability development at Engen, and what roles and responsibilities would you expect from the subject matter experts and developing engineers?

Preceding the field research, it was understood that the COP concept would work best if each SKG had its own COP before cross pollination was attempted. This would allow the focusing of goals at both the individual and community level. If the COP was to mature to a sufficient level then a cross pollination could occur. Whilst analysing the field results the below listed meaning units were established:

- Size of COP (Table 5-45)
- COP Leadership (Table 5-46)
- Semi-Structured Approach (Table 5-Table 5-747)
- External Resources (Table 5-48)
- Training Opportunities (Table 5-49)

These meaning units were developed from the significant statements tabulated in Tables 5-45 through 5-49 as per the parenthesis in the list above.

Table 5-45: Meaning Unit - Size of the COP

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	We would need to firstly define the minimum size of the community.

Although only one participant outlined their view on the size of the community, the view that a minimum size was presented by Jagdeo (2016):

“We would need to firstly define the minimum size of the community,” (Jagdeo, 2016).

Table 5-46: Meaning Unit - COP Leadership

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	Thus the leader is there to enable the COP such that people have all the reasons to attend the COP. Leaders also need to make the COP "hip," such that it is not observed as being some long boring meeting that is now requiring attendance from your team. The coffee session, or meeting of mind metaphor is a great one to encourage like-minded people to come together to discuss business related knowledge.
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	We also need to assign someone the role of leadership who is passionate about communities of practice, who would also be able to provide some of the needed structure for the COP. They would need to decide on the frequency of the meeting, quarterly would make sense to me, and thereafter perhaps a distribution of topics to be discussed.

The role of leadership within a COP was deemed crucial by two of the participants. Lochand (2016) and Jagdeo (2016), explained that the leader needs to become the catalyst for the COP:

“Thus the leader is there to enable the COP such that people have all the reasons to attend the COP. Leaders also need to make the COP "hip," such that it is not observed as being some long boring meeting that is now requiring attendance from your team,” (Lochand, 2016).

“We also need to assign someone the role of leadership who is passionate about communities of practice, who would also be able to provide some of the needed structure for the COP,” (Jagdeo, 2016).

Table 5-47: Meaning Unit - Semi Structured Approach

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	There is however a requirement to create a level of structure for the COPs. There is for an example a requirement to have a predetermined speaker to present on a topic; this removes the very real possibility of conversations requiring serendipity to occur. The COP discussion should not begin on open ended questions given to the floor for discussion.
Kumar Naidoo	
Kyle Pillay	Thus it is imperative that no one feels forced to attend, as doing that would defeat the advantages of the community. Hopefully this voluntary nature of the group would encourage people to bring something to share to the table for discussion.
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	This is in a sense the foundation of innovation as serendipity comes into play in the non-structured conversations that follow the structured introduction to a component of knowledge. This semi-structured approach needs to be implemented as the context needs to be relaxed to allow for the sharing of knowledge. Thus although we need some structure, we need to also equally specify the need for discussions and interactions. If everyone simply listens to the SME, very little learning will take place.

Pillay (2016) opened up his description with the mantra of a COP needing to be a voluntary initiative:

“Thus it is imperative that no one feels forced to attend, as doing that would defeat the advantages of the community,” (Pillay, 2016).

The idea of structure was further unpacked by Lochand (2016), who elaborated on the need of having pre-determined topics for discussion:

“There is however a requirement to create a level of structure for the COPs. There is for an example a requirement to have a predetermined speaker to present on a topic, this removes the very real possibility of conversations requiring serendipity to occur,” (Lochand, 2016).

Jagdeo (2016) was of a differing view when he promoted a learning model which relied more on serendipity and allowed the conversation to emerge in a relaxed environment:

“This is in a sense the foundation of innovation as serendipity comes into play in the non-structured conversations that follow the structured introduction to a component of knowledge. This semi-structured approach needs to be implemented as the context needs to be relaxed to allow for the sharing of knowledge. Thus although we need some structure, we need to also equally specify the need for discussions and interactions. If everyone simply listens to the SME, very little learning will take place,” (Jagdeo, 2016).

Table 5-48: Meaning Unit - External Resources

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	It is important to consider the role of external SMEs, as often we get our own silo mentalities by always relying on the subject matter experts who may not have been exposed to the variety of processes across the spectrum in industry.
Ashreya Singh	I would first start off by including all of those who are interested from our skills group. Thereafter I would definitely include the operations staff as they are always able to bring on site experience which supplements the theory been presented quite nicely. The support departments, such as maintenance would be an optional attendee. Thus we would not create an exclusive environment but more a target and supplementary personnel focus. At the end of the day we may not realise just how many people could benefit from the information especially if someone has been willing enough to attend the session.
Sarah Baker	I suppose when we are doing normal trouble shooting we could make use of a relatively wide community of practice to leverage various knowledge bases to solve the process issue. The wider audience would mean we have a varied perspective to build up with, as well as the more people involved the greater the learning effect.
Brian Jagdeo	There could be a benefit in having more than one SKG present at a COP, as often a situation which seems to be one dimensional will actually require multiple viewpoints to create successful solutions.

The width of the COP was unpacked under the meaning unit of external resources. A variety of perspectives was proposed by Baker (2016) as being beneficial:

“I suppose when we are doing normal trouble shooting we could make use of a relatively wide community of practice to leverage various knowledge bases to solve the process issue. The wider audience would mean we have a varied perspective to build up with, as well as the more people involved the greater the learning effect,” (Baker, 2016).

The silo mentality can be challenged with the implementation of external SMEs into COPs, as suggested by Pillay (2016):

“It is important to consider the role of external SMEs, as often we get our own silo mentalities by always relying on the subject matter experts who may not have been exposed to the variety of processes across the spectrum in industry,” (Pillay, 2016).

In summary, Singh (2016), suggests that the COP should be a grouping that allows as many individuals to attend who could benefit as well as contribute to the discussions being had (Singh, 2016).

“Thus we would not create an exclusive environment but more a target and supplementary personnel focus. At the end of the day we may not realise just how many people could benefit from the information especially if someone has been willing enough to attend the session,” (Singh, 2016).

Table 5-49: Meaning Unit - Training Opportunities

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	The training we provide will be aimed to reduce the costs associated with external training and to pitch the material at the correct level needed by the members of the audience. Once the training is completed the dual benefit would be that the audience would have learnt subject content, as well as

	getting to know who the subject matter experts are within the company. This will be beneficial in the future when the member of the audience requires assistance, they would have improved their network of knowledgeable people.
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The opportunities for holistic training was identified by Jagdeo (2016), who focussed on the learning elements aligned to knowledge networks, as the learners within the COP would be able to identify with the organisation's SMEs following the interaction in a COP:

“Once the training is completed the dual benefit would be that the audience would have learnt subject content, as well as getting to know who the subject matter experts are within the company. This will be beneficial in the future when the member of the audience requires assistance, they would have improved their network of knowledgeable people,” (Jagdeo, 2016).

Thus from these five meaning units the textural and structural description of the responses were assembled. From a textural perspective, leadership will be required in determining a lot of the structural variables associated with a COP. From the view of the participants a semi structure approach would encourage serendipitous conversation following a pre-determined topic of discussion. Successful training opportunities for everyone could occur with the introduction of members who are external to the SKG. With the structural perspective, external resources and training opportunities are the drivers for leadership to consider in design of a COP, without which a silo mentality is often experienced where there is an inertia around the manner in which knowledge workers solve problems and develop technically.

These descriptions form into the essence of the phenomenon which was that there remains a strong belief that a COP could be useful in combating the inertia around problem solving and development turnaround time. But as this concept is an organisational driver, it is imperative that the leadership structure the community with numerous variables in mind.

The coding structure is summarised graphically in Figure 5-10: Phenomenological Code for Question 14.

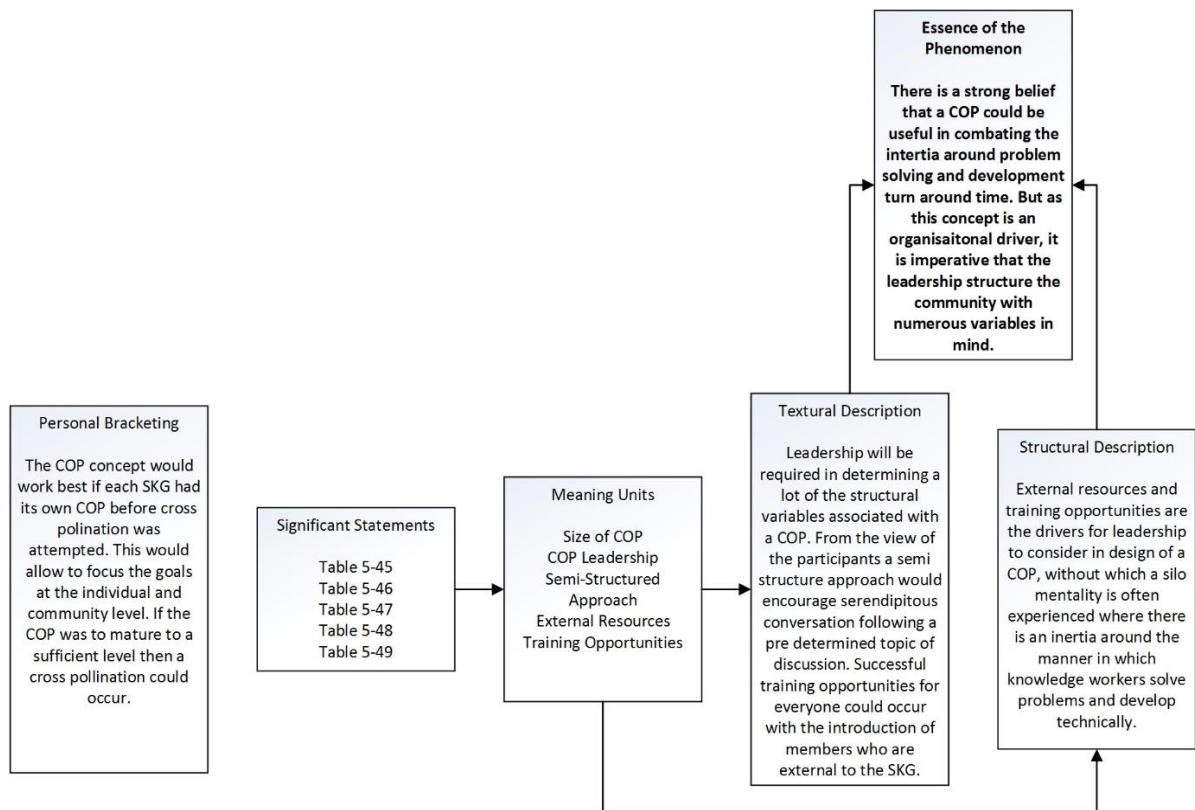


Figure 5-10: Phenomenological Code for Question 14

5.2.6.3 Question 15: How would you as a subject matter expert share your wealth of personal and organisational knowledge in a community of practice?

The view held was that SMEs should be using creative mechanisms for the transfer of knowledge. Often this can be done by case studies or simply being available when a junior is experiencing a problem in real time. A COP is a continuous community and not a weekly meeting. It would be best if the SMEs constantly refer back to the ACD as a guide for their knowledge transfer, as often the most difficult component of a knowledge assessment is finding out what is relevant. Whilst analysing the field results the below listed meaning units were established:

- Case Studies (Table 5-50)
- Dual Knowledge Transfer (Table 5-51)
- Use of Theory (Table 5-52)
- Lessons Learnt (Table 5-53)
- Alignment to ACD (Table 5-54)

These meaning units were developed from the significant statements tabulated in Tables 5-50 through 5-54 as per the parenthesis in the list above.

Table 5-50: Meaning Unit - Case Study

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	I would coach them through my experiences with similar issues, and try to show them how solving these problems can be tied back to their portfolio of evidence for their ACD.
Kyle Pillay	
Ashreya Singh	I believe that a case study approach is best in this instance, as when you combine the wealth of experience which would be present in the COP. The theory or presentation needs to be coupled with the explanation of the real experience of the trouble shooting process and the role of the engineer

	involved.
Sarah Baker	
Brian Jagdeo	<p>I would use case studies. The reason why I feel we should focus on case studies is theoretical knowledge can be read from a textbook. Case studies come from experience which is the application of knowledge.</p> <p>The structure would follow giving a background to the problem we had encountered and the various options we considered, before selecting a particular a solution, and an analysis of the implementation of the selected solution.</p> <p>The focus of case studies for me is what could distinguish a COP from say the knowledge available in external training or a classroom style lecture. At a university for instance the knowledge is merely theoretical. A case study approach is practical in nature which is a far stronger form of learning in my opinion.</p>

The case study approach was mentioned by three of the participants, as Singh (2016) articulately explains the benefit of coupling theory with experience when sharing knowledge:

“I believe that a case study approach is best in this instance, as when you combine the wealth of experience which would be present in the COP. The theory or presentation needs to be coupled with the explanation of the real experience of the trouble shooting process and the role of the engineer involved,” (Singh, 2016).

Jagdeo (2016), agreed with the sentiments of Singh (2016), and explained how a case study approach could be used to differentiate a COP from the knowledge available in external training course:

“I would use case studies. The reason why I feel we should focus on case studies is theoretical knowledge can be read from a textbook. Case studies come from experience which is the application of knowledge.

The structure would follow giving a background to the problem we had encountered and the various options we considered, before selecting a particular a solution, and an analysis of the implementation of the selected solution.

The focus of case studies for me is what could distinguish a COP from say the knowledge available in external training or a classroom style lecture. At a university for instance the knowledge is merely theoretical. A case study approach is practical in nature which is a far stronger form of learning in my opinion,” (Jagdeo, 2016).

Table 5-51: Meaning Unit - Dual Knowledge Transfer

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	I find that through these types of discussions we are able to both share ways in which we would go about solving the problem, and this is where learning is at its strongest.
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	

Naidoo (2016), felt that the knowledge sharing road should be in both directions, as discussions around a topic often brings opportunities for learning for both the learner and the SME:

“I find that through these types of discussions we are able to both share ways in which we would go about solving the problem, and this is where learning is at its strongest,” (Naidoo, 2016).

Table 5-52: Meaning Unit - Use of Theory

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	SMEs should compile a report and deliver a presentation to my colleagues for the purpose of dissemination of knowledge to other professionals within the organisation.
Ashreya Singh	

Sarah Baker	What we have at the moment within our skills group are the training programs presented by each of the technical professionals which would constitute our SME in the community of practice structure.
Brian Jagdeo	Yes there will be a need to include some theoretical knowledge, but this will be a very small portion of it, and would form the introduction of the discussion in the COP.

Within the skills group from which the participants were purposefully sampled, Baker (2016), explains the manner in which they are using theory in their training programs:

“What we have at the moment within our skills group are the training programs presented by each of the technical professionals which would constitute our SME in the community of practice structure,” (Baker, 2016).

As with most engineering knowledge transfer, theory is undeniably important when forming the introduction from which experience can be on context as explained by Jagdeo (2016):

“Yes there will be a need to include some theoretical knowledge, but this will be a very small portion of it, and would form the introduction of the discussion in the COP,” (Jagdeo, 2016).

Table 5-53: Meaning Unit - Lessons Learnt

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	You can also explain the role of operations and maintenance in the development of the solution as well as explain the lessons learnt. I feel as if it would be a really strong environment for the discussion of lessons learnt.
Sarah Baker	
Brian Jagdeo	

Singh (2016), was the only participant who felt that a COP would be a good environment to discuss lessons learnt:

“I feel as if it would be a really strong environment for the discussion of lessons learnt,” (Singh, 2016).

Table 5-54: Meaning Unit - Alignment to ACD

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	
Sarah Baker	The idea behind the training courses is aligned to the fact that a lot of junior engineers require some insights to close their awareness and knowledge gaps in certain technologies. Complimentary to this, a lot of our Senior Engineers and upwards require opportunities to train others as an outcome of their closure of the advanced gap on the TI&R.
Brian Jagdeo	

The alignment to the ACD was an important insight identified by Baker (2016) when she explained the dual benefit of conducting aligned training courses:

“The idea behind the training courses is aligned to the fact that a lot of junior engineers require some insights to close their awareness and knowledge gaps in certain technologies. Complimentary to this, a lot of our Senior Engineers and upwards require opportunities to train others as an outcome of their closure of the advanced gap on the TI&R,” (Baker, 2016).

Thus from these five meaning units the textural and structural description as the majority of engineering theory can be easily found, the most important component is to show what components of theory are aligned to ACD assessments and to illustrate these in the COP forums with the use of case studies and lessons learnt from previous experience. It needs to be remembered though that learning needs to be a dialogue, such that the SME can feel that they are also gaining knowledge by being a member of the COP, the concept of lifelong learning has been practiced by each participant. With the structural perspective, the experience of the participants leaning is crucial with the identification of them learning most

from others tacit knowledge transfer through the use of discussions on lessons learnt and case studies. These can be used to close ACD gaps from both the SME and learner perspective.

These descriptions form into the essence of the phenomenon which exists that the ACD assessment requires that a SME be able to produce a POE to show an advanced level of understanding. To achieve this there is a need to have a POE as proof of the experience of completing a certain tasks and proof that you have shown someone else how to do it. Both can be achieved whilst utilising lessons learnt and case studies. All the while the learners are learning through another's experience.

The coding structure is summarised graphically in Figure 5-11: Phenomenological Code for Question 15

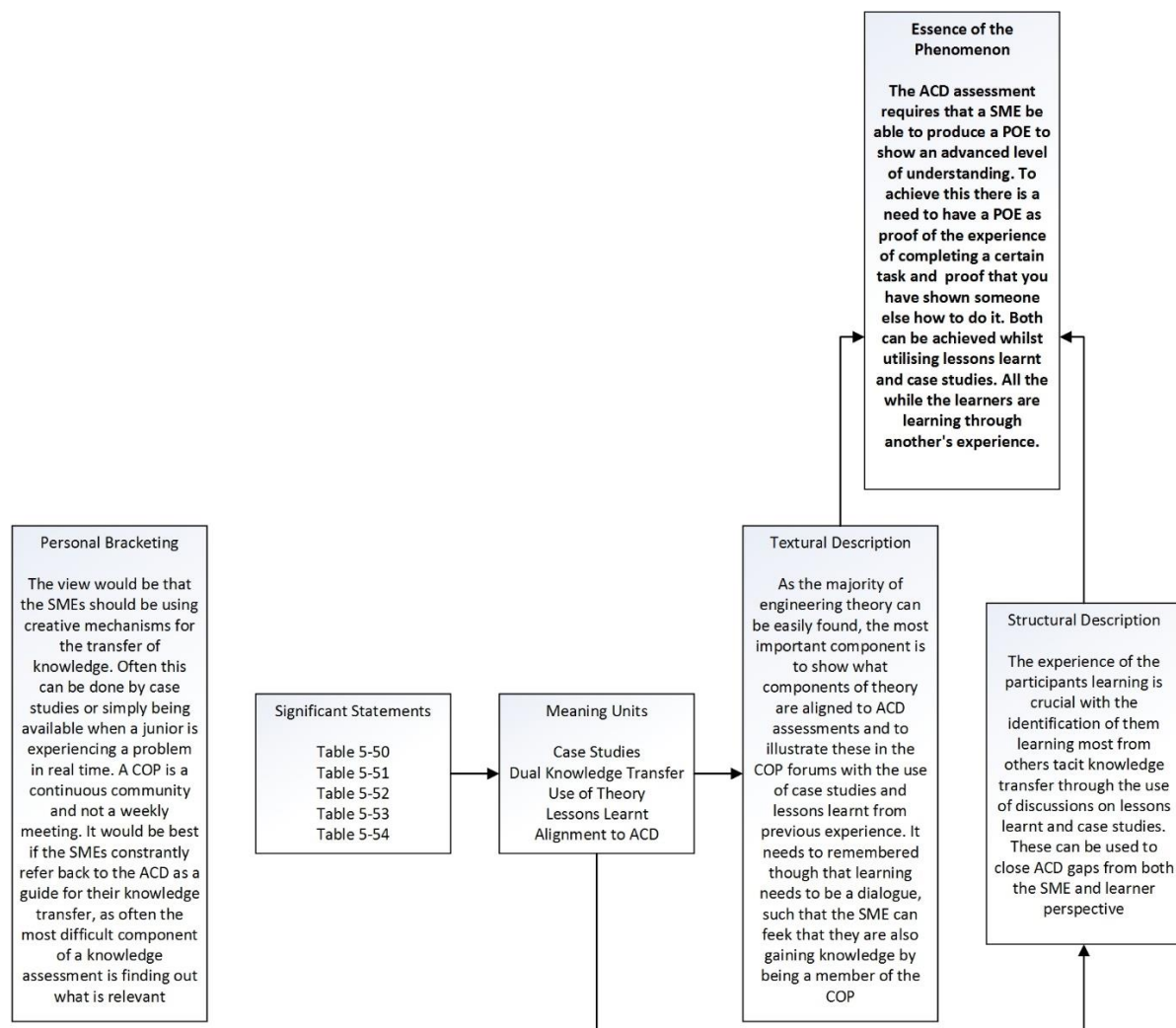


Figure 5-11: Phenomenological Code for Question 15

5.2.6.4 Question 16: With and understanding that collaboration and support from subject matter experts would be crucial for the success of communities of practice, what rewards and recognition systems would you suggest could be of benefit to grow communities of practice at Engen in the initial project stages?

Preceding the field research, it was assumed that financial rewards may bring people to the line-up at the start of a race, but only passion will take one to the finish line. The view is if we are able to fuel the passion of those who want to share their knowledge, a greater knowledge transfer will occur as the quality of the input from the SME will be proportional to the value they as well as others place on their valuable into a COP. Whilst analysing the field results the below listed meaning units were established::

- Against Remuneration as a Reward (Table 5-55)
- Elevation of Respect (Table 5-56)
- Desire to Share (Table 5-57)
- Non-Financial Reward (Table 5-58)
- Financial Reward (Table 5-59)

These meaning units were developed from the significant statements tabulated in Tables 5-55 through 5-59 as per the parenthesis in the list above.

Table 5-55: Meaning Unit - Against Remuneration as a Reward

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	Personally I am an individual who feels that the reward should be beyond just simple financial gain. Financial gain is almost a trading scheme, which could create a situation that the training that an SME can be a part of would be proportional to the direct financial gain drawn from it.
Kumar Naidoo	
Kyle Pillay	I don't believe that money is a great enough motivator for the TPs, as money can only last for a short while. Options like travelling to other refineries to gain individuals and in essence skills group knowledge asset could be just reward for deserving engineers.

Ashreya Singh	
Sarah Baker	Money again is a nice to have but it not necessary when we consider all the other rewards and more importantly recognition systems we could be using better within Engen. Money is generally not the reason we lose people when they reach the higher echelons within our organisation.
Brian Jagdeo	

Three of the participants were against the idea of money being used as leverage to try and get buy in to the COP. As Baker (2016) explained:

“Money again is a nice to have but it not necessary when we consider all the other rewards and more importantly recognition systems we could be using better within Engen. Money is generally not the reason we lose people when they reach the higher echelons within our organisation,” (Baker, 2016).

Both Pillay (2016) and Singh (2016) concurred with Baker as they stated:

“I don't believe that money is a great enough motivator for the TPs, as money can only last for a short while,” (Pillay, 2016).

“Personally I am an individual who feels that the reward should be beyond just simple financial gain,” (Lochand, 2016)

Table 5-56: Meaning Unit - Elevation of Respect

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	<p>I would suggest that we as leadership need to brand the SMEs as being exactly that, experts of their fields of knowledge, such that everybody can begin to respect them as SMEs.</p> <p>Unfortunately the organisation does not do the above which allows us to have a view of these SMEs as being merely like all of the other employees. Thus we need to elevate their status within the organisation, not financially at first but to rather create this hype around their importance to the organisation, and the value they add, the years they have spent gaining this knowledge and expertise.</p>
Kumar Naidoo	People want to feel special and respected, and through the right recognition

	systems people can understand that they are indeed recognised for the effort they are putting into development. It is very important that management are able to remain sincere about the recognition given to a SME. These recognition systems will reinforce the behaviour of transferring their knowledge onto others.
Kyle Pillay	Although SMEs would be crucial within a COP, it is important to elevate the respect they secure within the organisation, as at present they often feel that they are simply experts by job profile.
Ashreya Singh	
Sarah Baker	There is a normal remuneration once an engineer is promoted up to the level of TP, but I feel that there needs to be a greater prestige around the idea of being a TP. They always present the idea that following the TP path is equivalent to following the TM path, but I often see the discrepancy in prestige.
Brian Jagdeo	

The meaning unit labelled elevation of respect was mentioned by four of the six participants. As Pillay (2016) explained the current level of respect given to the SMEs:

“Although SMEs would be crucial within a COP, it is important to elevate the respect they secure within the organisation, as at present they often feel that they are simply experts by job profile,” (Pillay, 2016).

Lochand (2016), was in agreement and made mention of the correction needing to be made in terms of expressing the level of respect towards the organisation’s SMEs:

“We need to elevate their status within the organisation, not financially at first but to rather create this hype around their importance to the organisation, and the value they add, the years they have spent gaining this knowledge and expertise,” (Lochand, 2016).

Naidoo (2016), suggests that a greater focus needs to be placed on the selection of recognition systems to further cement the importance of SMEs to the organisation:

“People want to feel special and respected, and through the right recognition systems people can understand that they are indeed recognised for the effort they are putting into development,” (Naidoo, 2016).

Table 5-57: Meaning Unit - Desire to Share

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	I find that there are numerous theories around the world, but money is not a true motivator, money is not a true game changer, because simply put it is never enough. Your desire to share has to beyond money. If as a leader I have not broken through that mental barrier, then simply throwing money at you, success rates will be undoubtedly be pretty low, because then you simply just see it as a means to an income. You do not see it as a burning desire to mentor, to teach, to grow.
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	<p>I feel that there is a need for an internal reward. I don't believe any other reward would see the full benefit for the program. This is because for an SME to present quality information to others it is only the desire to see other people learn and succeed which would fuel them and make them passionate about giving this their best shot.</p> <p>Some people are very passionate about sharing and teaching whilst others are not. How do you get people to do something that they are not passionate about? I just don't feel that placing a reward whether its financial or otherwise as a carrot will encourage the right level of teaching from the SMEs for the full benefit of the COP.</p>
Sarah Baker	
Brian Jagdeo	

The intrinsic value towards having a desire to share was identified by Lochand (2016) and Singh (2016). From a leadership perspective Lochand (2016), explained the need to break through the mental barrier of equating effort with financial gain:

"I find that there are numerous theories around the world, but money is not a true motivator, money is not a true game changer, because simply put it is never enough. Your desire to share has to beyond money. If as a leader I have not broken through that mental barrier, then simply throwing money at you, success rates will be undoubtedly be pretty low, because then you simply just see it as a means to an

income. You do not see it as a burning desire to mentor, to teach, to grow,” (Lochand, 2016).

Singh (2016) felt that an intrinsic reward would be the only reward that would drive the effort to ensure the success of a COP:

“I feel that there is a need for an internal reward. I don't believe any other reward would see the full benefit for the program. This is because for an SME to present quality information to others it is only the desire to see other people learn and succeed which would fuel them and make them passionate about giving this their best shot,” (Singh, 2016).

Table 5-58: Meaning Unit - Non Financial Reward

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	A reward does not necessarily need to be money. It could be the case that in the right forum you call the guy up and you give him a nice certificate and maybe a small gift voucher. The aim is not to create an expectation that a person must get something, but more a reward that management can invoke when they see that someone in particular is excelling.
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	This is against the traditional corporate concept of rewards, where generally an initiative like the above will be greeted with plaque or a shake of the hands and a pat on the back.

Lochand (2016), reiterates that rewards are broader than simply financial gain:

“A reward does not necessarily need to be money. It could be the case that in the right forum you call the guy up and you give him a nice certificate and maybe a small gift voucher,” (Locahand, 2016).

Table 5-59: Meaning Unit - Financial Reward

(Lochand, 2016); (Naidoo, 2016); (Pillay, 2016); (Singh, 2016); (Baker, 2016); (Jagdeo, 2016)

Participant	Significant Statement
Sudhir Lochand	
Kumar Naidoo	
Kyle Pillay	
Ashreya Singh	
Sarah Baker	
Brian Jagdeo	<p>Although some people might like the traditional form of recognition, many modern employees want to see the value add feedback into their financial gain from the company.</p> <p>For me I feel that is sad that we treat financial reward with such taboo. But in my opinion is if someone is able to improve the company's bottom line, they themselves must be rewarded proportionally. And the idea of the once off performance bonus will drive that same person to continue to innovate as well as motivate others in a similar position to raise the level of their ideas for improving Engen's business. Companies appear to sometimes not want to endorse these types of ideas, as they may inadvertently create a workforce whose goal is to create elaborate mechanisms to improve the company's bottom line. You can end up with an internally very competitive working environment, which may get out of control in time. But it's an idea anyway which could lead to massive innovation for the organisation.</p>

Although Jagdeo (2016), was the only individual who endorsed the financial gain reward mechanism, his points were strongly substantiated as he noted:

“Although some people might like the traditional form of recognition, many modern employees want to see the value add feedback into their financial gain from the company. For me I feel that is sad that we treat financial reward with such taboo. But in my opinion is if someone is able to improve the company's bottom line, they themselves must be rewarded proportionally,” (Jagdeo, 2016).

“Companies appear to sometimes not want to endorse these types of ideas, as they may inadvertently create a workforce whose goal is to create elaborate mechanisms to improve the company's bottom line. You can end up with an internally very competitive working environment, which may get out of control in time. But it's an

idea anyway which could lead to massive innovation for the organisation,” (Jagdeo, 2016).

Thus from these five meaning units the textural and structural description of the responses were assembled. From a textural perspective, there is a need for the SMEs to have a strong desire to share their knowledge with other members in a COP. In return an elevation of respect is believed to be the greatest incentive as many feel that money would not be a motivator in knowledge transfer. However if the SMEs contribution impacted a business KPI sufficiently well, due financial rewards could reinforce this positive behaviour cycle. With the structural perspective, participants felt that the greatest impact on SMEs sharing their knowledge would be an elevation of respect towards their position within the organisation, as they often experienced being undermined at present. The remuneration debate was twofold, with a focus on not making a SME feel that there is a means to an end, however if there was a direct impact of their actions as an SME within a COP, a financial reward should be considered.

These descriptions form into the essence of the phenomenon which was that the desire to share coupled with the recognition of expertise are the pillars on which the COP should be built. Financial rewards upfront may increase the quantity of time spent by the SMEs on the COP, but a strategy towards rewarding successful implementation may result in an increase in quality of the work inputted by the SME into the COP.

The coding structure is summarised graphically in Figure 5-12: Phenomenological Code for Question 16

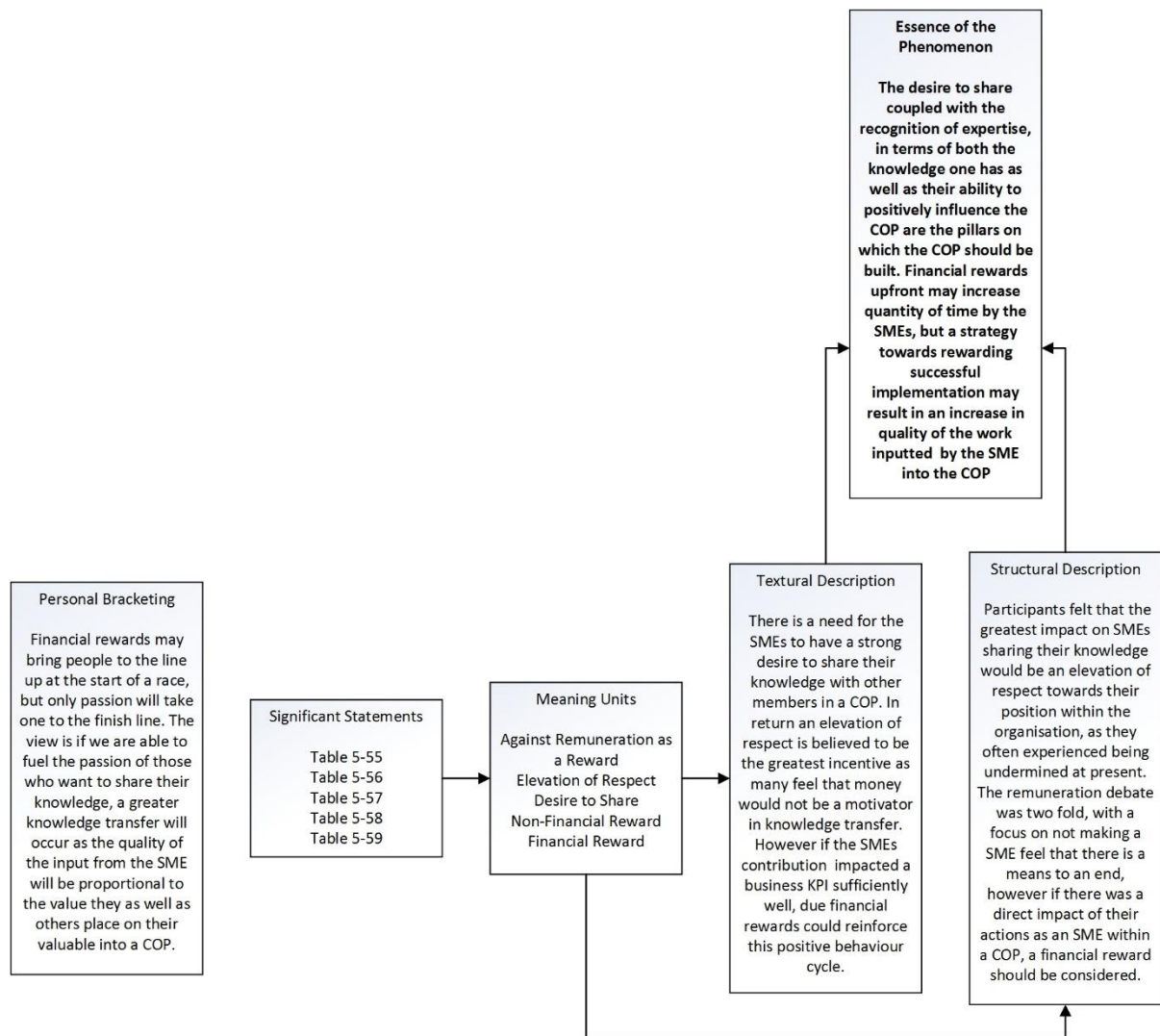


Figure 5-12: Phenomenological Code for Question 16

5.2.7 Objective 3: Develop a Community of Practice Structure as a Knowledge Management Strategy for Engen.

Objective 3 of the research was purposeful in nature, attempting to develop from the responses of the participants' a community of practice structure for Engen. Four questions from the research instrument were focussed on this field of knowledge management. The primary data obtained was analysed through a phenomenological approach to reveal the following essences of the phenomenon under study:

- ❖ A COP structure has not been implemented within Engen, but there was consensus in terms of the hope that the collection of like-minded people would indeed bring an increase in knowledge transfer and rate in which technical related problems would be solved.
- ❖ There remains a strong belief that a COP could be useful in combating the inertia around problem solving and development turnaround time. But as this concept is an organisational driver, it is imperative that the leadership structure the community with numerous variables in mind.
- ❖ The ACD assessment requires that a SME be able to produce a POE to show an advanced level of understanding. To achieve this there is a need to have a POE as proof of the experience of completing a certain tasks and proof that you have shown someone else how to do it. Both can be achieved whilst utilising lessons learnt and case studies. All the while the learners are learning through another's experience.
- ❖ The desires to share coupled with the recognition of expertise are the pillars on which the COP should be built. Financial rewards upfront may increase quantity of time spent by the SMEs on the COP, but a strategy towards rewarding successful implementation may result in an increase in quality of the work inputted by the SME into the COP.

The support from the participants for the benefits of the COP was a strong finding of the research. Perhaps the most crucial outcome from the entire research was the identification of the COP structure being a suitable mechanism for the attainment of the ACD gap closure requirements for both the SMEs as well as the junior engineers. As with any initiative

leadership would be tasked with the catalysing of a COP system before it succeeds. The importance of the recognition of expertise and the desire to share, were outlined as the pillars from which leadership could build a successful COP structure. Reward systems were felt to be the greatest benefit when packaged as a celebration of a COP measured success. The selection of the reward system varied, which outlined the need of leadership to understand on an individual level what drives productivity from their knowledge workers.

5.2.8 Objective 4: Recommendations for Systematic and Holistic Knowledge Management Strategies towards Sustainable Knowledge Transfer within the Engineering Knowledge Workers at Engen

The objective aligned to systemic and holistic knowledge management strategies will be presented in 6.2 Recommendations from Analysis of Field Research and Literature on page 143.

5.3 Conclusion

The purpose of this fifth chapter was to develop an understanding of the status quo of various knowledge management approaches amongst Engen's TP who were sampled to be participants within the study. Each of the first three objectives was focussed on allowing for an appreciation of the use of personal knowledge management approaches, the impact of organisational knowledge management strategies at Engen presently, as well as the preferred structure for a community of practice within Engen.

All of the names and identities of the participants were protected with pseudonyms, with each response referenced to these six pseudonyms.

Chapter Six - Conclusions and Recommendations

6.1 Introduction

This chapter concludes the research process by offering recommendations based on an analysis of the primary and secondary data obtained in Chapter Five - Results and Discussions and Chapter Three - Literature Review respectively. The recommendations form part of the accomplishment of objective 4 of this research, which is built on the development of sustainable strategies aligned to the first three objectives. The chapter is concluded with suggestions for further research in the area of knowledge management which were focussed on in this research.

6.2 Recommendations from Analysis of Field Research and Literature

6.2.1 Objective 1: Personal Knowledge Management Strategies

6.2.1.1 Primary Data Summary

The crucial findings focussed on individuals being required to focus on their time and effort on their own development. To facilitate this strategy there was a emphasis on individuals being able to development PKM skill sets.

6.2.1.2 Secondary Data Summary

Collins and Kolb (2011), proposed that knowledge is created and maintained within a cycle of connects and disconnects, whose implications can be considered both from a theoretical perspective as well as from a practical perspective, (Collins & Kolb, 2011, p. 130).

1. Personal knowledge can rarely ever be considered to be stand-alone in its nature.
2. Individuals need to be connected to others such that new knowledge can be created.
3. Periods of reflective thought are required to assimilate new knowledge over time.

6.2.1.3 Conclusions and Recommendations for Implementation

In conclusion when comparing the findings from primary and secondary research it was noted that a structure was lacking within Engen from which both individuals and the organisation could base its PKM development. As described by Cheong and Tsui (2011), general guidelines to be considered when implementing an individual PKM strategy as described in Table 6-1 below, (Cheong & Tsui, 2011, pp. 217-218).

Table 6-1: Individual PKM Strategy

(Cheong & Tsui, 2011, pp. 217-218)

Strategic Element	Description
Treat PKM skills as a valuable asset for self-development	The ability to utilise learnt PKM skills on a daily basis within individual's personal circumstances are crucial for successful implementation as they affirm the good practices that were learnt in theory
Develop PKM skills which meet both the needs of the organisation as well as the individual	PKM skills can facilitate both the success of organisational and individual knowledge strategies as long as there is an alignment between these two goal posts of success.
Create information source lists and processes for quality control	This element is crucial as the ability to find information in the digital age may on the surface appear to be a simple task, however the ability to discern the quality of the information found is crucial in ensuring that a "garbage in - garbage out," metaphor is not exhibited.
Develop the skills necessary to organise information	Organising information successfully can be broken down into data storage and data retrieval. If information is stored in a logical and traceable manner, data retrieval will follow in a similar standard.
Develop a learning conducive environment	The environment in which an organisation facilitates should be conducive to learning, such that employees feel encouraged to become self-directed learners, aiming to find personal meaning in their job.

The following are general guidelines to be followed in implementing an organisational PKM strategy in Table 6-2 below, (Cheong & Tsui, 2011, pp. 219-220).

Table 6-2: Organisational PKM Strategy

(Cheong & Tsui, 2011, pp. 219-220)

Strategic Element	Description
Treat PKM skills as being assets for the sustainability of an organisation	Organisations by virtue of treating PKM skills as sustainability assets need to seek to maintain and improve individual's ability to manage their personal knowledge, in their aim to meet organisational learning objectives.
Development of PKM skill set as part of broad human capital management	The concept of the PKM skills inventory is similar to that of the mind map in the way in which it is able to develop systems that allow the organisation to have at their fingertips the knowledge relating to learning capability of every individual, with an understanding of their relative strengths and weaknesses.
PKM skills become part of performance management and reward systems	In an ideal situation both the performance management and reward systems of employees within an organisation should be related to the individual learning agents, as a form of motivation for initiatives to be completed.
Develop an individual learning plan for individuals to develop their PKM skillset	Following the development of individuals PKM inventory and evaluation practices, the organisation should embark together with the individuals to develop personalised learning plans. This development can align individuals towards their next level in competency. This can be seen as individual learning agent's success building collectively towards the organisations learning objectives.

6.2.2 Objective 2: Organisational Knowledge Management Strategies

6.2.2.1 Primary Data Summary

The findings based on the primary research was that the alignment of the organisation's and the various knowledge workers' knowledge goals were justified as being one of the greatest tasks of the leadership within the organisation.

6.2.2.2 Secondary Data Summary

Snowden and colleagues (2011) define KM with the listing of seven principles, which need to be considered by all involved in knowledge management. These in essence summarise quite deeply the evolving nature of OKM, (Snowden, et al., 2011, p. 125).

- 1 *“Knowledge can only be volunteered: it cannot be conscripted.*
- 2 *We always know more than we can say, and we will always say more than we can write down. The process of taking things from our heads, to our mouths (speaking it) or to our hands (writing it down) involves loss of content and context.*
- 3 *The way we know things is not the way we report we know things.*
- 4 *We only know what we know when we need to know it. Human knowledge is deeply contextual and requires stimulus for recall.*
- 5 *Tolerated failure imprints learning better than success.*
- 6 *In the context of real need few people will withhold their knowledge. A genuine request for help is not often refused unless there is literally no time or previous history of distrust.*
- 7 *Everything is fragmented. We evolved to handle unstructured fragmented fine granularity information objects, not highly structured documents.” (Snowden, et al., 2011, p. 125)*

6.2.2.3 Conclusions and Recommendations for Implementation

When comparing the findings produced by the primary and secondary research it was noted that alignment between individual and organisations goals needs to be understood in terms of the correct manner in which we attempt to manage knowledge from an organisation wide knowledge management strategy. This change from the current knowledge strategy is not an easy task to succeed in. Sandrock (2008) does however recommend four leverage points which could assist the strategy of implementing the knowledge management change, (Sandrock, 2008, p. 15). These strategic elements are summarised in Table 6-3 below.

Table 6-3: Organisational KM Strategy

(Sandrock, 2008, p. 15)

Strategic Element	Description
A compelling vision of the future and a purpose to believe in:	Before members of the organisation leave the status quo, they need to have an understanding of what the future holds for them. The knowledge manager is tasked with the development of the vision of what the future operation would be like.
Reinforcement through recognition systems	There will always be members of the organisation who are able to recognise the positive influence and embrace the changes required to implement the knowledge management strategy. These pioneers need to be recognised as leaders, as it will serve the dual purpose of recognition as one of the first to adopt the system, as well as reinforcing a replication of behaviour in other members of the organisation. The majority of individuals are fearful of change and as such would only change once seeing the success of another person's adoption of change.
Providing the skills for the future state	It is imperative that the knowledge management team is fully trained and able to implement the strategy, and the entire infrastructure required from a technical perspective is in place before strategy role out. At launch leadership need to be seen in full support of the strategy. In the early stages the workforce will need to be trained to fully utilise the resources available via the knowledge management framework.
Ensure consistent role models	There is a need to create compelling role models to which will help facilitate the implementation of the knowledge management initiative.

	The facilitation required would be in the form of communicating the compelling vision and how it will add value to each individual.
--	---

6.2.3 Objective 3: Community of Practice as a Knowledge Management Strategy

6.2.3.1 Primary Data Summary

The most crucial outcome was the identification of the COP structure being a suitable mechanism for the attainment of the ACD gap closure requirements for both the SMEs as well as the junior engineers. The selection of the reward system varied, which outlined the need of leadership to understand on an individual level what drives productivity from their knowledge workers.

6.2.3.2 Secondary Data Summary

To develop a structure for a COP, Wenger (1998) discussed that there are three dimensions to be considered (Wenger, 1998, p. 73):

1. Community - How it functions
2. Domain - What it is about
3. Practice – What capability it has produced

The structure and purpose of a COP is based on the manner in which each of these dimensions are defined, (Wenger, 1998, p. 75).

6.2.3.3 Conclusions and Recommendations for Implementation

In conclusion although a COP according to Wenger (1998), finds its strengths in the manner in which it is structure and purpose driven, Chatti (2012) argues that the world is much more complex and as such a greater adaptability is required in the turbulence in which individuals are tasked to develop their competency. Although the major finding from the primary research was the applicability of the COP towards ACD gap closure, it was deemed that there were currently too many barriers to knowledge sharing for a COP to be a suitable approach at Engen. The recommendation for implementation within a community perspective is for the organisation to follow the knowledge ecology concept in terms of structure. In Table 6-4

below an analysis of the community, domain and practice dimensions is given from which strategic leverage could be gained from the organisation.

Table 6-4: Knowledge Ecology KM Strategy

(Chatti, 2012, pp. 837-838).

Strategic Questions	Description
Community	Knowledge ecology is driven by “independence and autonomy rather than membership, mutual engagement, and belonging to a community.” Additionally instead of being required to interact continuously with other members of a COP, within the realm of knowledge ecology, everyone relies on their individual PKN. In times of need people would naturally turn to their personal relations in order to learn and get their work done, rather than trying to gain access to an organisationally driven community of practice.
Domain	Knowledge ecologies have no ties “to a shared practice, a joint enterprise, or an overarching domain.” Instead they are open to one and all, flexible and multidisciplinary social entities. Knowledge ecologies emerge naturally without strong predetermined rules or external authority. Knowledge ecologies are thus self-controlled and self-contained entities, focussing on individuals developing their own PKN.
Practice	Knowledge ecologies lack the development of a shared repertoire and are thus open and distributed knowledge domains. Instead of a fixed domain, knowledge resources are distributed over different individual’s PKNs within a greater knowledge ecology. The outcome of participating in a COP is the growth of a community’s set of common resources and practices. In distinction the participation within knowledge ecology is a restructuring of every individual’s PKN. This means that there is, a reframing of one’s theories-in-use, which can be seen as an individual’s approaches to problem solving as well as an extension of one’s external knowledge network with new tacit and explicit knowledge nodes. The tacit nodes take the form of people whom you can network with as well as information which forms the part of the explicit nodes.

6.3 Recommendations for Further Research

At the end of all research the cycle should return back to the field of knowledge allowing for further discoveries in parallel topics. The primary research was undertaken with a focus on the knowledge workers within Engen who had already attained a significant level of competence in their engineering role. Thus a topic for further research could be:

- ❖ Research into engineering knowledge workers development with a focus on knowledge management approaches to graduate development programs.

Another topic could be the further unpacking of the personal knowledge network paradigm in incorporation with the structure of a COP:

- ❖ Research into the synthesis of both the community of practice as well as personal knowledge networks towards the development of an engineering competency development program.

6.4 Conclusion

This chapter will concluded the research process by offering recommendations which formed the accomplishment of objective 4 of this research, which is built on the development of sustainable strategies aligned to the first three objectives. Aligned to these first three objectives strategies were tabulated which are recommended to be considered for implementation within Engen.

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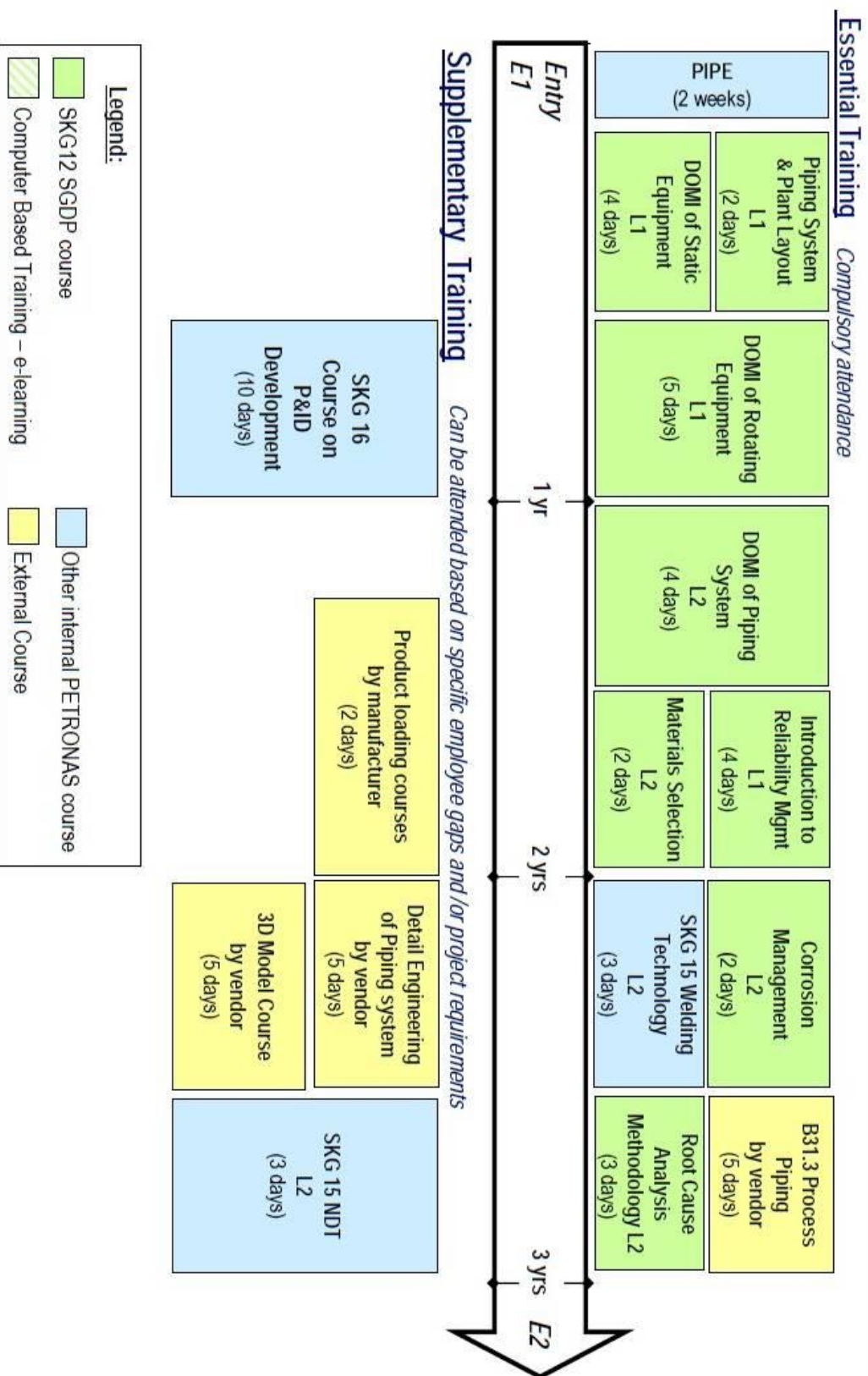
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Appendix A: ACD Resources

A1: Skills Development Matrix

SKILL DEVELOPMENT MATRIX FOR PIPING (SKG122)							
Tech. Class	Technology Inventory	Classroom Training	E-learning Modules	Skill Level 0 to 1 (Awareness)	Skill Level 1 to 2 (Knowledge)	Skill Level 2 to 3 (Skill)	
				Self Learning/ Hands On	Self Learning/ Hands On	Self Learning/ Hands On	
1	Codes and standards	Internal Courses: - Material Selection L3 (3 days) (SKG15 CSD L2 Module) - DOWI of Piping System External Courses: - B31.3 Process Piping by TTC, EDS, etc (5 days)		SL: - Read and understand PTS 31.38.0/11 on piping general requirement - Read and understand ASME, API, ASTM - Read piping handbooks e.g. CASTI handbook, Mc Grawhill - Read project plant specifications from previous projects Hands On: - Prepare project technical specifications with supervision of senior piping engineer	SL: - Read relevant material catalogs to learn about detailed technical specifications eg. MESIC, plant's project piping specification. Hands On: - Prepare & review project technical specifications (internal and external) - Participate discussion with vendors on technical specifications to familiarize with procurement specification for piping components	Hands On: - Lead in development and preparation of project technical specifications (internal and external) - Participate in project / maintenance / plant change team and review solutions to ensure compliance with codes and standards - Participate in peer review exercise for piping - Lead discussion with vendors on technical specifications	SL: - Read technical papers on new technologies - Be member of ASME 31.3 - Code Committee Hands On: - Provide training on Code and Standards (in house/ internal training) - Review PTS - Lead peer review exercise for piping
Base							

E1 Training Roadmap – Static Piping



A2: Training Roadmap

A3: Technology Inventory and Ruler

TECHNOLOGY INVENTORIES		AWARE					KNOWLEDGE		SKILLED		ADVANCE		EXPERT		Trainee Engineer		Engineer		Senior Engineer		Staff Engineer		Principal Engineer		Custodian		
BASE	B1	Codes and Standards														0	0	0	0	0	0	0	0	0	0	0	0
	B2	Computer Aided Design - 3D Modelling														0	0	0	0	0	0	0	0	0	0	0	0
	B3	Piping System Design and Selection														0	0	0	0	0	0	0	0	0	0	0	0
	B4	Pressure Design and Over Pressure Protection														0	0	0	0	0	0	0	0	0	0	0	0
	B5	Special Pipes Supports														0	0	0	0	0	0	0	0	0	0	0	0
	B6	Hot Tapping, Stripping and Line Freezing														0	0	0	0	0	0	0	0	0	0	0	0
	B7	Fabrication														0	0	0	0	0	0	0	0	0	0	0	0
	B8	Installation and Commissioning														0	0	0	0	0	0	0	0	0	0	0	0
	B9	Inspection and Maintenance														0	0	0	0	0	0	0	0	0	0	0	0
	B10	Product Loading Systems														0	0	0	0	0	0	0	0	0	0	0	0
KEY	K1	Special Valves Selection and Specification														0	0	0	0	0	0	0	0	0	0	0	0
	K2	Internal / External Corrosion Protection														0	0	0	0	0	0	0	0	0	0	0	0
	K3	Stress Analysis														0	0	0	0	0	0	0	0	0	0	0	0
	K4	Condition Monitoring														0	0	0	0	0	0	0	0	0	0	0	0
	K5	Asset Life Assessment														0	0	0	0	0	0	0	0	0	0	0	0
	K6	Stress Corrosion Resistant Piping														0	0	0	0	0	0	0	0	0	0	0	0
PACING	P1	Fatigue Analysis Finding Production Facility													0				0	0	0	0	0	0	0	0	
EMERGING	E1	Developments in Material and Material Construction																									

Appendix B: Research Instruments

B1: Informed Consent Letter

UNIVERSITY OF KWAZULU-NATAL
Graduate School of Business and Leadership

Dear Respondent,

M Com Research Project

Researcher: Cameron Pitman (0795772824)

Supervisor: Alec Bozas (0823344477)

Research Office: Ms P Ximba 031-2603587

I, Cameron Byron Pitman am a Masters of Commerce in Leadership Studies student in the Graduate School of Business and Leadership at the University of KwaZulu-Natal. You are invited to participate in a research project entitled *Engineering Knowledge Management as a Foundation for Capability Development at Engen Refinery*.

The significance or rationale for this study is for the researcher to be able to provide an insight into the complex study of engineering capability development. In particular it has been perceived that strategic leverage could be gained by the organisation if a greater focus was placed on its engineering knowledge workers developing their knowledge management skills. In particular the philosophy of personal knowledge management as being the foundation of organisational explicit knowledge management will be explored. Additionally the use of communities of practice as a foundation for the sharing of tacit knowledge within the organisation will be analysed. Together these two strategies are hypothesized to be able to facilitate the growth of engineering capability within Engen's refinery.

Through your participation I hope to understand the level of use of personal knowledge management strategies within the engineering knowledge workers at Engen. An understanding will be developed of the impact of organisational knowledge management strategies within Engen. Concepts aligned to the development of communities of practice

structure as a knowledge management strategy for Engen will be explored. Lastly recommendations of systematic and holistic knowledge management strategies for the sustainable knowledge transfer within the engineering knowledge workers at Engen will be proposed.

The results of the qualitative interview are aimed to contribute to each of the objectives above aligned to the development of knowledge management strategies within Engen Petroleum Limited. Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this research project. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

If you have any questions or concerns about participating in this study, please contact me or my supervisor at the numbers listed above. The interview should take us about 60 minutes to complete the questionnaire. I hope you will take the time to participate in this research.

Sincerely

Investigator's signature_____ Date_____

This page is to be retained by participant

UNIVERSITY OF KWAZULU-NATAL
Graduate School of Business and Leadership

M Com Research Project

Researcher: Cameron Pitman (0795772824)

Supervisor: Alec Bozas (0823344477)

Research Office: Ms P Ximba 031-2603587

CONSENT

I _____ (full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

Signature of Participant

Date

This page is to be retained by researcher

B2: Research Instrument

Demographic and Experience

1. For demographic purposes, please could you confirm your gender, ethnicity and age?
2. What is your academic background?
3. How long have you been working within the petrochemical industries and with which companies?
4. Have you had any engineering experience from an industry outside of petrochemical, and if so how would you compare the learning experiences between petrochemical and non-petrochemical industry.

Personal Knowledge Management

5. What do you believe were pivotal goals you achieved on your journey to being an Engen Technical Professional, and how did you go about achieving them?
6. What is your understanding of lifelong learning and how do you try and link this concept with the continuous development of your knowledge?
7. Do you believe that there are conflicts of interests or priorities between an individual's goals for self-development and the goals of the organisation, and if so what can an individual do to better align themselves?
8. What are your thoughts on information overload? How do you, as an individual try to manage information in this knowledge based economy?

Organisational Knowledge Management

9. What strategies exist to facilitate knowledge management and knowledge transfer within your SKG?
10. What could be possible barriers to knowledge sharing within Engen?

11. What has been your experience of the organisations promotion of you as an individual's quest for personal knowledge?
12. What do you believe are links or barriers between someone's personal knowledge management goals and the goals of the organisation? How can the organisation better align these goals?

Communities of Practice

13. What aspects do you believe would form part of the tri-benefit of communities of practice for individuals, the community as well as Engen overall?
14. How would you structure a community of practice to be aligned to engineering capability development at Engen, and what roles and responsibilities would you expect from the subject matter experts and developing engineers?
15. How would you as a subject matter expert share your wealth of personal and organisational knowledge in a community of practice?
16. With and understanding that collaboration and support from subject matter experts would be crucial for the success of communities of practice, what rewards and recognition systems would you suggest could be of benefit to grow communities of practice at Engen in the initial project stages?

B3: Gatekeepers Letter

With us you are Number One



29 February 2016

Engen Petroleum Limited
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Republic of South Africa
Reg. No. 1989/003754/06
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To whom it may concern

CONFIDENTIALITY AGREEMENT BETWEEN CAMERON PITMAN AND ENGEN PETROLEUM LIMITED

This letter serves to acknowledge that CAMERON PITMAN (Co.no. 75931) is hereby given permission to conduct research within Engen Petroleum Limited (Refinery Division) for the purposes of obtaining his Master's degree at the University of Kwa-Zulu Natal. The following research topic has been approved and supported by the organisation:

An Investigation into Engineering Knowledge Management as a Foundation for Capability Development at Engen Refinery, Durban.

During the course of his research, he will be supervised by the Engen Refinery Librarian, Lucy Naidoo, and all activities will require her endorsement.

The above approval is given provided Mr Pitman adheres to the following conditions of access:

- Maintains the privacy and confidentiality of all accessible project data and understands that unauthorised disclosure of confidential data may result in disciplinary, civil, and/or criminal actions against him.
- May not disclose data or information to anyone other than those to whom he is authorised to do so.
- Should his employment be terminated or his work in relation to the project discontinues for any reason, he will continue to be bound by this signed Confidentiality Agreement.

Signed on behalf of Engen Petroleum Limited

Thabani Zondi

Human Resource Business Partner

Engen Refinery

29/02/2016

Date

Agreed and signed by Researcher:

Cameron Pitman

02/03/2016

Date

B4: Ethical Clearance



01 June 2016

Mr Cameron Pitman (209510595)
Graduate School of Business & Leadership
Westville Campus

Dear Mr Pitman,

Protocol reference number: HSS/0554/016M

Project title: Investigating Engineering Knowledge Management as a Foundation for Capability Development at Engen Refinery

Full Approval – Expedited Approval

With regards to your application received on 13 May 2016. The documents submitted have been accepted by the Humanities & Social Sciences Research Ethics Committee and **FULL APPROVAL** for the protocol has been granted.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Dr Shamila Naidoo (Deputy Chair)

/ms

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