

Cranfield University



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***Factors in the implementation of a sustainable knowledge
management programme***

School of Industrial and Manufacturing Science

Ph.D. Thesis

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management programme***

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Abstract

Purpose

Knowledge Management (KM) is by now a recognized term, increasingly accepted in the corporate community. This research contributes a better understanding of its implementation by providing a list of factors, which though each seems self-evident, their combination, and the experience acquired in applying them would support practitioners applying KM, and constitute a stepping stone for researchers for deepening the knowledge about it.

Research context

Israel Aircraft Industries (IAI), where this research has been conducted, is a large aerospace and defence company that has gone through a change process inclusive of KM implementation.

Research approach

A qualitative research strategy with a constructivist paradigm using action research (the author also being the director of knowledge of the company), was used. A case study methodology has been utilized over five divisions representing the average KM performance in the company. Sources of information have included questionnaires, interviews, data from the various management tools employed by the programme, and author's observations.

Success factors for KM implementation

The factors relevant to the General Manager of an organization and to the Knowledge Manager were found to be:

- The profile of the knowledge manager.
- The perception of relevance of KM to the business.
- A structured framework for the organization to follow.
- The acceptance of long term values.
- Management support.
- The openness of the General Manager to external knowledge.
- The knowledge manager's initiative.

Originality is found in:

- Application of a comprehensive KM framework, its procedures and measures.
- A multi-level measurement of KM goals as a link to the organization's business goals.
- Application of the Hoshin Kanri method for the management of KM.
- Application of a staged assessment of maturity for a KM implementation.
- The factors mentioned above, their peculiar combination and further understanding of the GM and the knowledge manager roles.

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My late parents have incrustated in me the passion for learning. Without their dedication, I wouldn't have by now the will needed to embark on such a voyage. I am sure they would have been very proud of this accomplishment.

I dedicate this thesis to my wife and companion for life, Malca.

Author Profile

Rony Dayan is a retired Lt. Colonel of the Israeli Air Force, with industrial experience as deputy GM of MBT, one of the Israel Aircraft Industries divisions belonging to the electronics group. Before that, he was the corporate marketing representative in South East Asia where he received the IAI President Marketing Award for outstanding performance.

Rony has been leading the effort to incorporate Knowledge Management in the company ever since 2002. He has designed the programme, has managed it ever since the beginning, and it is being implemented now across the five groups and over twenty divisions of this 2B\$ Aerospace & Defence company.

Rony has also given courses in Business & High-Tech Marketing in the School of Business Administration at the Israeli College of Management.

Rony holds an Engineering degree from the Technion in Haifa, Israel, and a Masters Degree, both in Electronics, from the US Air Force Institute of Technology at Wright Patterson AFB, in Dayton, Ohio, USA.

Rony's research interests are in the field of Knowledge Management and of measuring its performance and impact in a large corporation.

At the stage in life in which most people think about retiring and resting on the laurel leaves collected in the case of Rony along two careers, one in the IAF, and one in industrial management, he pointed to the academy to research what he has been preaching for all along.

Publications

Books

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Table of Contents

Abstract	I
Acknowledgements	II
Author Profile	III
Publications	IV
Table of Contents	V
Table of Figures	XI
Tables	XII
Glossary	XIII
1 Introduction	1-1
1.1 Introduction	1-1
1.2 Context of the research	1-1
1.2.1 The change programme	1-2
1.2.2 The research topic – knowledge management	1-2
1.3 Description of the industrial research problem in its context	1-3
1.3.1 The research problem	1-3
1.3.2 The research question	1-4
1.4 Thesis structure	1-4
1.5 Chapter overview	1-8
2 Research Approach	2-1
2.1 The research strategy	2-1
2.2 The research philosophy	2-3
2.3 The research methodology	2-5
2.3.1 Case studies	2-7
2.4 The research methods	2-8
2.4.1 Questionnaires	2-9
2.4.2 Interviews	2-11
2.5 Action research and its implications	2-12
2.5.1 The double hat of the author	2-14
2.5.2 Risk associated with action research	2-14
2.6 The research environment	2-15
2.7 The research analysis	2-16
2.7.1 Data reduction	2-16
2.7.2 Data display	2-17
2.7.3 Conclusions drawing and verification	2-17
2.8 Chapter's overview	2-18
3 Literature Review	3-1
3.1 Change	3-1
3.2 Knowledge management	3-2
3.2.1 The definition of knowledge	3-2
3.2.2 The definition of knowledge management	3-3
3.2.2.1 Epistemological approach	3-3
3.2.2.2 Ontological approach	3-5
3.2.3 KM generations	3-6
3.2.4 KM strategy	3-7
3.2.5 KM frameworks	3-8
3.2.5.1 The knowledge life cycle framework	3-8

3.3	KM implementation	3-9
3.3.1	The importance of knowledge management	3-9
3.3.2	KM links to business strategy.....	3-10
3.3.3	KM contribution to performance	3-12
3.3.3.1	KM as process knowledge	3-13
3.3.3.2	Contribution to R&D	3-14
3.3.3.3	Contribution to management	3-16
3.3.3.4	Benchmarks	3-17
3.3.4	KM processes	3-19
3.3.4.1	Capturing and reusing knowledge	3-19
3.3.4.2	Competence centres	3-21
3.3.4.3	Communities of practice	3-21
3.3.5	The knowledge manager task.....	3-25
3.3.6	The environment.....	3-30
3.3.7	Culture as a component of the environment	3-33
3.4	Success factors for implementation	3-35
3.5	KM performance measurement.....	3-42
3.5.1	Why do we measure	3-42
3.5.2	Goal setting and metrics	3-43
3.5.2.1	Objective measurement	3-43
3.5.2.2	Relative measurement	3-44
3.6	Chapter overview	3-45
4	The IAI KM Programme	4-1
4.1	Who is IAI?.....	4-1
4.2	The competitive advantage initiative	4-1
4.3	The value and behaviour change.....	4-2
4.4	The IAI KM programme.....	4-4
4.4.1	The life cycle of knowledge	4-5
4.4.1.1	Knowledge capture and documentation	4-6
4.4.1.2	Knowledge retrieval for reuse.....	4-6
4.4.1.3	New knowledge creation	4-6
4.4.1.4	Knowledge sharing.....	4-6
4.4.2	The knowledge management procedures.....	4-6
4.4.2.1	Knowledge capture and documentation	4-7
4.4.2.2	Knowledge retrieval for reuse.....	4-7
4.4.2.3	New knowledge creation	4-8
4.4.2.4	Knowledge sharing.....	4-8
4.4.3	The roles participating in KM implementation	4-9
4.4.3.1	The division's GM.....	4-9
4.4.3.2	The division knowledge manager (DKM).....	4-10
4.4.3.3	The division's personnel	4-11
4.4.3.4	The director of knowledge (DoK).....	4-11
4.4.3.5	The interaction between the participants.....	4-12
4.4.4	The implementation plan.....	4-13
4.4.4.1	Programme content, balance, and timing	4-13
4.4.4.2	Methodologies usage	4-14
4.5	The Hoshin Kanri tool for KM management in IAI	4-15
4.5.1	Literature review on Hoshin Kanri	4-16

4.5.2	Hoshin Kanri implementation	4-18
4.5.2.1	Objectives	4-19
4.5.2.2	Measures	4-19
4.5.2.3	Actions	4-20
4.5.2.4	Division directorates' participation	4-20
4.6	The self and mutual assessment tool.....	4-20
4.6.1	Literature review on self assessment.....	4-20
4.6.2	Self assessment implementation	4-22
4.6.2.1	Programme management and implementation	4-23
4.6.2.2	Knowledge capture and documentation	4-23
4.6.2.3	Knowledge retrieval for reuse.....	4-24
4.6.2.4	New knowledge creation	4-24
4.6.2.5	Knowledge sharing.....	4-24
4.7	Chapter overview	4-24
5	Collecting the Evidence	5-1
5.1	Choice of divisions as case studies	5-1
5.2	Operationalizing success	5-2
5.2.1	Programme success and not business success	5-3
5.2.2	Success as a variable – a working definition	5-4
5.3	What in the PDM is considered as success	5-5
5.3.1	Objectives	5-5
5.3.2	Measures	5-5
5.3.3	Actions	5-5
5.3.4	Division involvement	5-6
5.4	What in the mutual assessment data is considered as success	5-6
5.5	Using questionnaires to gather participants position.....	5-7
5.5.1	The design of the questionnaires	5-7
5.5.1.1	The MAKE survey	5-7
5.5.1.2	The Kentucky University survey	5-8
5.5.2	The GM questionnaire	5-10
5.5.3	The knowledge manager questionnaire	5-11
5.6	Using interviews to refine questionnaire's information	5-11
5.6.1	The semi-structured interview	5-12
5.7	Researcher observations	5-12
5.7.1	Quarterly reviews	5-12
5.7.2	Day-to-day observation	5-13
5.8	Chapter overview	5-13
6	Success Factors	6-1
6.1	Comparative patterns of factors	6-1
6.1.1	Factors from the literature	6-2
6.1.2	Factors from experience	6-5
6.1.2.1	Independent factors.....	6-7
6.1.2.2	Dependent factors.....	6-7
6.1.3	The factors influencing the roles active in KM implementation.....	6-8
6.1.3.1	Factors related to the GM.....	6-8
6.1.3.2	Factors related to the division knowledge manager	6-8
6.1.3.3	Factors related to the division's environment	6-9
6.1.3.4	Factors related to the director of knowledge	6-10

6.1.4	Proposed model of factors	6-10
6.1.4.1	Long term values 	6-12
6.1.4.2	Management support 	6-13
6.1.4.3	Perception of relevance to division performance 	6-13
6.1.4.4	Division self perception 	6-14
6.1.4.5	Quality of performance of the programme 	6-14
6.1.4.6	Knowledge manager profile 	6-15
6.1.4.7	Initiative 	6-16
6.2	Deduction from raw data collection	6-16
6.2.1	Based on the questionnaires.....	6-16
6.2.1.1	GM questionnaires	6-17
6.2.1.2	DKM questionnaires	6-21
6.2.2	Based on the researcher's observations	6-23
6.2.3	Based on the PDM.....	6-26
6.2.4	Based on the mutual assessment results	6-27
6.3	Chapter overview	6-27
7	Analysis of the Results	7-1
7.1	Research per division	7-3
7.1.1	Division A.....	7-3
7.1.1.1	GM pattern	7-3
7.1.1.2	DKM pattern	7-5
7.1.1.3	Division exploratory pattern.....	7-6
7.1.1.4	Interviews as a reinforcement to the exploratory phase	7-11
7.1.1.5	Researchers observations.....	7-12
7.1.1.6	Pattern of behavioural factors	7-13
7.1.1.7	PDM pattern	7-14
7.1.1.8	Mutual assessment pattern	7-17
7.1.1.9	Pattern of performance.....	7-19
7.1.1.10	Division analysis.....	7-20
7.1.2	Divisions J, N, S, U	7-23
7.1.3	Emerging pattern of proposed conclusions.....	7-23
7.2	Validation of the proposed pattern over additional divisions	7-26
7.3	Final conclusions	7-28
7.4	Chapter overview	7-29
8	Reflections and Recommendations	8-1
8.1	Reflections in respect of the research.....	8-1

8.1.1	The research process	8-1
8.1.2	Research strengths.....	8-1
8.1.3	Potential weaknesses	8-2
8.2	Reflections in respect of knowledge management.....	8-3
8.2.1	KM as a young discipline	8-3
8.2.2	The importance of a KM strategy structure	8-3
8.2.2.1	Implementation timing	8-3
8.2.2.2	The choice of a framework	8-4
8.2.2.3	Link to business.....	8-4
8.2.3	The importance of management tools.....	8-5
8.2.4	Reflections in respect of the research objectives	8-6
8.3	What could be learned from the literature	8-7
8.3.1	Success factors.....	8-7
8.3.2	KM frameworks	8-7
8.3.3	Linking KM to the business	8-8
8.3.4	The management tool of Hoshin Kanri.....	8-8
8.3.5	Monitoring KM capability maturity	8-8
8.4	Research conclusions regarding the factors related to the GM and the DKM.....	8-8
8.5	Contribution to knowledge	8-10
8.6	Recommendation for further research	8-11
8.6.1	Expansion to other types of organizations	8-11
8.6.2	Elimination of the action research issue.....	8-11
8.7	Contribution to practitioners	8-11
8.7.1	A road map to business success	8-12
8.8	Final comment	8-12
9	References	9-1
10	Appendices	10-1
	Appendix 1: Rank order tables of KM activities	10-1
	Appendix 2: Success factors (1).....	10-4
	Appendix 3: Success factors (2).....	10-6
	Appendix 4: Preliminary factors.....	10-8
	Appendix 5: Proposed factors	10-9
	Appendix 6: The KM-PDM.....	10-10
	Appendix 7: The mutual assessment questionnaire	10-11
	Appendix 8: The mutual assessment matrix.....	10-14
	Appendix 9: Self and mutual assessment results	10-17
	Appendix 10: The GM questionnaire	10-18
	Appendix 11: The DKM questionnaire.....	10-26
	Appendix 12: Sample of day-to-day KM interaction.....	10-33
	Appendix 13: Table shells	10-35
	Appendix 14: Division J analysis	10-40
14.1	GM pattern	10-40
14.2	DKM pattern	10-41
14.3	Division exploratory pattern.....	10-43
14.4	Interviews as a reinforcement to the exploratory phase	10-47
14.5	Pattern of behavioural factors	10-48
14.6	PDM pattern	10-48

14.7	Mutual assessment pattern	10-50
14.8	Pattern of performance.....	10-52
14.9	Division analysis.....	10-52
Appendix 15:	Division N analysis	10-55
15.1	GM pattern	10-55
15.2	DKM pattern	10-56
15.3	Division exploratory pattern.....	10-58
15.4	Interviews as a reinforcement to the exploratory phase	10-61
15.5	Pattern of behavioural factors	10-63
15.6	PDM pattern	10-63
15.7	Mutual assessment pattern	10-65
15.8	Pattern of performance.....	10-66
15.9	Division analysis.....	10-67
Appendix 16:	Division S analysis.....	10-69
16.1	GM pattern	10-69
16.2	DKM pattern	10-70
16.3	Division exploratory pattern.....	10-72
16.4	Interviews as a reinforcement to the exploratory phase	10-76
16.5	Pattern of behavioural factors	10-77
16.6	PDM pattern	10-78
16.7	Mutual assessment pattern	10-80
16.8	Pattern of performance.....	10-81
16.9	Division analysis.....	10-82
Appendix 17:	Division U analysis	10-84
17.1	GM pattern	10-84
17.2	DKM pattern	10-85
17.3	Division exploratory pattern.....	10-87
17.4	Interviews as a reinforcement to the exploratory phase	10-92
17.5	Pattern of behavioural factors	10-93
17.6	PDM pattern	10-93
17.7	Mutual assessment pattern	10-95
17.8	Pattern of performance.....	10-97
17.9	Division analysis.....	10-97

Table of Figures

Figure 1-1: The thesis navigator	1-6
Figure 3-11: Bi-directional information and knowledge transformation process for decision making (Hicks et al, 2002)	3-20
Figure 4-1: Company Vision	4-3
Figure 4-2: IAI values	4-3
Figure 4-3: The KM vision	4-5
Figure 4-4: The roles participating in KM implementation	4-9
Figure 6-1: The success factors generation	6-1
Figure 7-1: Analysis process	7-2
Figure 7-2: Pattern of necessary, supportive, or sufficient factors for KM implementation	7-29

Tables

Table 1-1: Chapter/Aim/Outcome.....	1-6
Table 2-1: Paradigm positions on selected practical issues	2-5
Table 3-2: Primary activity classes in the knowledge chain model	3-6
Table 3-6: Differences between personnel and process knowledge	3-13
Table 3-7: CSFs called by authors (modified from (Alazmi and Zairi, 2003))	3-35
Table 3-8: Barriers to KM implementation	3-39
Table 3-9: Drivers of KM.....	3-39
Table 3-10: Single most important factor in KM implementation	3-40
Table 4-1: Comparison of planning for different business process management systems	4-18
Table 5-1: Divisions chosen as case studies.....	5-2
Table 6-1: Success factors from the literature, their significance and their source	6-5
Table 6-2: Original list of factors	6-6
Table 6-3: Preliminary list of factors	6-7
Table 6-4: Labelling groups of factors	6-11
Table 6-5: GM's pride for KM performance as compared to self assessment results.....	6-17
Table 6-6: Distribution of the GM questions by factors.....	6-19
Table 6-7: Distribution of the DKM questions by factors.....	6-21
Table 6-8: 'Table shells' for division A	6-25
Table 6-9: Actions in the PDM.....	6-26
Table 6-10: Distribution of factor's effect on assessment questions.....	6-27
Table 7-1: Division A - GM behavioural pattern.....	7-4
Table 7-2: Division A - DKM behavioural pattern.....	7-6
Table 7-3: Pattern of behavioural factors for division A	7-13
Table 7-4: Division A - Pattern of performance.....	7-20
Table 7-21: Factors and results for the case studies.....	7-24
Table 8-1: Pattern of necessary, supportive or sufficient factors for the GM and the DKM	8-10

Glossary

BPR -	Business process reengineering
CAI –	Competitive advantage initiative
CC –	Competence centre
CEO -	Chief executive officer
CKO –	Chief knowledge officer
CMM –	Capability maturity model
CoP –	Community of practice
COO -	Chief operating officer
CSF -	Critical success factor
DKL –	Directorate knowledge leader
DKM –	Division knowledge manager
DoK –	Director of knowledge
DOKB -	The distributed organization knowledge base
EVP -	Executive vice president
GM –	General Manager
HQ –	Headquarters
HR –	Human resources
IAI –	Israel aircraft industries
IAI-Net -	IAI Intranet
ILS -	Integrated logistic support
IPT -	Integrated product team
IT –	Information technology
KL -	Knowledge leader
KLC -	Knowledge life cycle
KM-PDM -	Knowledge management PDM
KPI -	Key process indicators
M/A –	Mutual assessment
MBO -	Management by objectives
NPI –	New product introduction
OM -	Organizational memory
PKM -	Personal knowledge management
PDM –	Policy deployment method
PDPR –	Policy deployment progress review
QM -	Quality management
S/A –	Self assessment
T1 -	The CEO of the company
T17 -	The group general managers, the vice presidents, and the officers of the company
T50 -	The general managers of the 23 divisions and additional HQ managers at the same level
T300 -	The directors of the 23 divisions and additional HQ managers at the same level (respectively reporting to the T50 level)
T1000 -	The section chiefs of the 23 divisions and additional HQ managers at the same level (respectively reporting to the T300 level)
T14000 -	Each and every employee of the company
VT -	Virtual team

1 Introduction

“We believe that the future belongs to companies that can take the best of the East and the West and start building a universal model to create new knowledge within their organizations.” (I. Nonaka and H. Takeuchi)

1.1 Introduction

Over the past decade, many companies have gone through the process of trying to remake themselves into significantly better competitors. These efforts have gone under many banners: total quality management, reengineering, right sizing, restructuring, cultural change, and turnaround. Nevertheless, in most cases, the basic goal has been the same – to make fundamental changes in how business is conducted in order to help cope with a new and more challenging market environment.

The world is indeed changing, and organizations cannot stop the world from changing. The best that can be done is to adapt - the smart ones change before they have to; the lucky ones manage to scramble and adjust when pushed; the rest are losers - they become history. In the final analysis, the customer determines the winners from the losers.

Leaders of successful organizations are consistently searching for better ways to improve performance and results. Frequent disappointments with past management initiatives have motivated managers to gain new understandings into the underlying, but complex mechanisms – such as knowledge – which govern an enterprise's effectiveness. In attempting to apply their collective expertise to the service of competitive advantage, corporations opted only lately for the management of their intellectual property.

Knowledge management, far from being a management 'fad', is broad, multi-dimensional and covers most aspects of the enterprise's activities. To be competitive and successful, experience shows that enterprises must set broad priorities and integrate the goals of managing effective knowledge processes as knowledge creation, development, organization and leverage. This requires systematic knowledge management.

1.2 Context of the research

Israel Aircraft Industries (IAI), where this research is being conducted has based its change programme on a set of four values – Customers, People, Innovation and Technology, and One Company. Various actions were designed to transform those values into a tangible and concrete programme. One of those actions has been the one of knowledge management. IAI has been implementing knowledge management ever since May 2002 (Dayan, 2003).

In order to coordinate and manage the programme across the company, procedures have been defined to detail the 'who', 'how', 'when', 'using which tool', and 'how does it measure'. The research subject would therefore deal with what 'makes it tick', what induces the 'who' to implement the KM defined by the company, 'how' does he do it, 'when', or what is the better timing for it; with the way it is measured; and also with the question if and how can these procedures

be used to pull more organizations and lower level of personnel into the programme as well as supplying division's management, good reasons to use it for their own business results.

1.2.1 The change programme

The change programme has been implemented in IAI ever since the year 2000. This paved the way for the acceptance that:

- It is permissible to have intangible goods (such as customer intimacy, communication and involvement, learning organisation or knowledge management) as long as it is backed and supported by concrete, tangible and measurable actions.
- It is permissible to find non-direct way to achieve results.

This created an environment more favourable to the implementation of a programme which incorporates intangible goods:

- KM actions are expected to deliver performance goals.
- A mental link is created with individuals between intangible goods and the use of intangible or tacit knowledge.

Such an environment, in which terms such as internal communication and knowledge sharing are not new to people, would be expected to be more approving for the implementation of KM procedures as 'communities of practice', or 'good practices'. This doesn't mean it would make it straightforward and the author has dealt more about it within the research for the establishment and performance of the various KM procedures.

1.2.2 The research topic – knowledge management

The author's research is focused on the sustainable implementation of knowledge management, as the representative of a change process in IAI - the representative of a large corporation.

The strategy for knowledge management in IAI was set for the following goals:

- Improving the availability of knowledge to IAI employees.
- Organisation learning from failures as well as from successes.
- Cultivating the potential for the creation of new knowledge.
- Enhancing knowledge sharing among IAI employees.
- Increasing the awareness to knowledge management.

The author has established the concept of the life cycle of knowledge¹ around the goals of the knowledge management strategy enumerated above. Knowledge management was established then as a comprehensive programme including all four phases of this life cycle:

- Knowledge capture and documentation.
- Knowledge retrieval for reuse.
- New knowledge creation.
- Knowledge sharing.

Once this being declared, it became very clear that the knowledge management action is significant to most of the change programme. The purpose of

¹ To be detailed in section 4.4.1.

knowledge management being to foster innovation and to create and share knowledge, in order to promote business goals, it was therefore defined as:

"The process of identifying, capturing, leveraging and creating knowledge to deliver value to customers¹".

The ultimate goal of the knowledge management action (as all other actions within the change programme) has been to achieve a required competitive advantage. The relationship of the KM implementation with the operational goals and the business results was therefore established through the measures for the KM implementation². Specific procedures³ to perform the required activity and to measure their influence and possibly their concrete effect on business results were phrased out for each phase.

1.3 Description of the industrial research problem in its context

The subject of knowledge management is one that is very much dependent of cultural⁴ issues (related to the organisation) and behavioural issues (related to people). The KM process is consequently a social one and the research will therefore incorporate social principles.

Given the "soft" nature of KM as well as its results being closely measured and monitored, qualitative research types will be employed. The context and the situation of good access to data within IAI, the author - researcher being the champion on the subject, have led him to base the research strategy on multiple case studies, using data from a set of divisions representing the whole company but also the various levels of involvement in the programme that exist in the company (not necessarily the successful ones).

Data already collected is based on the KM achievements being monitored by the management system⁵ used in IAI, on the self and mutual assessment being performed routinely, as well as on active and passive observation, and on one-to-one interviews as described in chapter 4.

1.3.1 The research problem

This research is based on the following hypotheses:

- Companies, acting in the modern hyper-competitive environment surrounding them, have to constantly examine the way they are built, the way they operate and how do they prioritise their actions and try to optimise and at least to adapt.
- Change is not a natural process and people and organization would rather inert in their actual stage if it wasn't for the entrepreneurs advocating the implementation of the change.

¹ The author will show other definitions in chapter 3 for the literature review.

² Detailed in section 4.5.2.

³ Detailed in section 4.4.2.

⁴ The issue of culture has been addressed in section 3.3.7.

⁵ Introduced in section 4.5.

- Knowledge management is becoming more and more one of the more prominent ways of leading/coordinating/integrating (depending on the extent of the implementation) this effort, adding to it an additional dimension – the one of being better next time (if there is any).

1.3.2 The research question

On the basis of these hypotheses, the following research question has been developed for further investigation and explanation:

"What are the dominant factors in the implementation of a sustainable knowledge management programme in a large corporation"?

In general 'what' questions may either be exploratory or about prevalence (Yin, 2003). Chapter 2 will elaborate on the reasoning behind the choice of a research approach.

1.4 Thesis structure

Each of the nine chapters of the thesis was written with an aim in mind. These are meant to depict a complete picture, to tell a flowing story of the implementation of KM in IAI and of what one can learn from it. The learning process is done chapter by chapter, so it is important to realize at the end of each one of them the achievement in that respect (see table 1-1).

Following it the author has provided the reader with a thesis navigator showing the chapters, their main sections and the primary issues exposed along the research (see figure 1-1). The IAI KM programme is represented by the model of the role bearers for KM implementation, the PDM (the way the programme is managed), and the mutual assessment matrix; the success factors show the seven recommended ones with their icons; and the analysis of the results introduces the five division chosen as case studies and the additional two with which the author validated the results.

Chapter	Aim	Outcome
1 – Introduction	To provide an overall presentation of the research and the way it is presented in the thesis.	A better understanding of the research and a facilitated orientation along the thesis.
2 – Research Approach	To drill down the research strategy, philosophy, methodology, and methods, and to build the rationale for the proper research approach to be taken in order to comply with the requirements of the research analysis.	Basic understanding and perspective of the various choices existing for a research approach, given the existing environment; and the advantages and threats associated with action research and the means by which these were treated.

Chapter	Aim	Outcome
3 – Literature Review	To relate to the main topics that have been published about the subjects dealt with within the research including change, knowledge management, and its measurement.	Awareness about the existing body of knowledge on knowledge management, its definition and implementation and on its related subjects.
4 – The IAI KM Programme	To position the industrial context being the environment for the research; and to present the IAI KM programme, its peculiar characteristics, management and measurement tools.	A better appreciation of the complexity of the environment; the essence of the IAI KM programme; and the role of the participants in its implementation.
5 – Collecting the Evidence	To explain the rationale of choosing the specific divisions to compose the multiple case studies and to describe the various tools of data collection, being questionnaires, interviews, and personal observations; to draw boundaries to the definition of success and to propose a working definition to be used along the research as the aim of performance.	A relative assurance that the research is not based on a biased choice of divisions as case studies; a description of the sustainability of the implementation of the programme as its success; and an appreciation of the information gathered from the questionnaires, interviews, and personal observations. A stepping stone for the next chapters showing that care was taken in data collection, that the researcher was thorough, and that he has a rich and deep data set.
6 – Success Factors	Using the literature and the researcher's experience, to find the factors expected to play a role in the implementation of the programme, to propose them as hypotheses, to relate them to the various roles involved with the implementation, and to connect them to the various sources of information.	Realization of the combination of factors that could improve the chances for KM implementation, and understanding the possible influence they would have on the different roles involved with the implementation.

Chapter	Aim	Outcome
7 – Analysis of Results	Using the factors generated, looking for their application in the divisions as they relate to the GMs and DKMs positions, and analysing their correlation to the success parameters in the triangulated five case studied divisions, to discern a possible pattern of combination of factors which seems to correlate with success in programme implementation.	Realizing a possible correlated picture of factors and successes, with a high/low value to each factor confirmed through observing additional divisions.
8 – Reflections and Recommendations	To revisit the context of the research, its topic, and the notion of success from the point of view of influencing KM implementation, to emphasize the novelty of the work, and to suggest expanding from the limitation the research took upon itself.	Presentation of the 'winning' combination of factors, and reflections on the research, its process, topic and results, so as to objectively criticizing it and proposing additional avenues for future research; recommendations for practitioners, and a potential road map to evolve from programme to business success.
9 – References	List of the literature used for the research.	Perspective of the body of knowledge related to in the thesis.

Table 1-1: Chapter/Aim/Outcome

Figure 1-1: The thesis navigator

1. Introduction

2. Research Approach

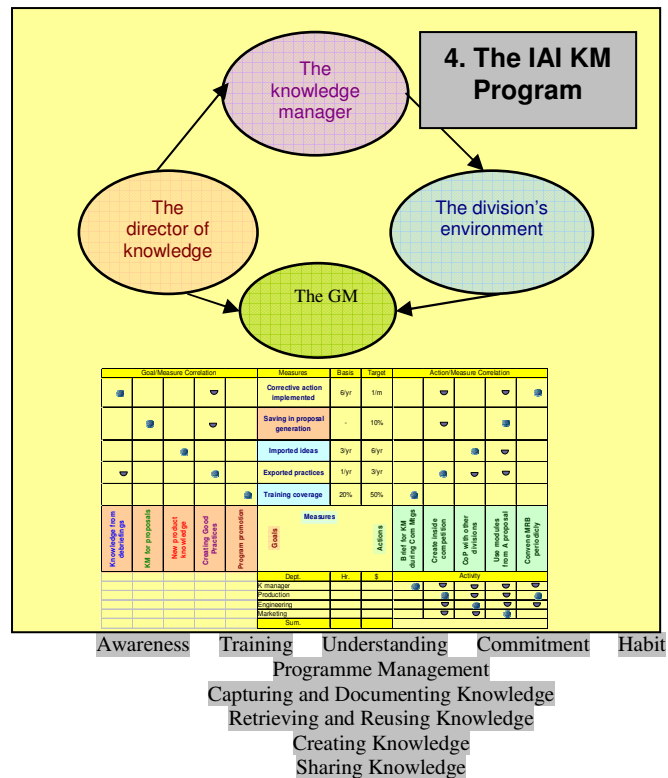
- Strategy
- Philosophy
- Methodology
- Methods
- Action Research
- Environment
- Analysis

3. Literature Review

- Knowledge Management
- KM Implementation
- KM Performance

5. Collecting the Evidence

- Choice of Divisions
- Success
- PDM
- Mutual Assessment
- Questionnaires
- Interviews
- Observations



6. Success Factors



- Literature
- Experience
- Questionnaires
- Interviews
- PDM
- Mutual Assessment

7. Analysis of Results

Division A

Division
J

Division
N

Division
S

Division
U

- Pattern of Behavioural Factors
- Pattern of Performance
- Division Analysis

Division K

Division E

8. Reflections and Recommendations

1.5 Chapter overview

The chapter provides the background and context to this work in researching the implementation of a change process as knowledge management in organizations considered large, not necessarily by the number of their employees but rather by the diversity of their organization. The focus of the research was briefly clarified. The chapter ends with an overview of the structure of the thesis, and a diagram meant to facilitate the navigation of the reader along the thesis helping him to better understand its logic and sequence.

2 Research Approach

Nothing is as practical as a good theory (Kurt Lewin)

2.1 The research strategy

The principal aim in choosing a research strategy is to achieve the best procedure for dealing with a research topic, and particularly, for answering research questions. Robson (Robson, 2002) describes a road map for the choice of the appropriate research strategy. In cases where data is typically non-numerical and could be affecting the design along with its collection, where the focus of the study is on processes and where direct involvement of the researcher would inevitably initiate change, a flexible design is probably best indicated in order to cope with these changes. This type of design is also referred to as qualitative strategy as opposed to quantitative strategy coupled with fixed design.

Qualitative research strategies are considered especially powerful and appropriate for process evaluations. These are aimed at elucidating and understanding the internal dynamics of programme operations. They focus on the following kinds of questions: What are the factors that come together to make this programme what it is? What are the strengths and weaknesses of the programme? (Patton Michael Quinn, 1987) Process evaluations most typically require a detailed description of programme operations. Such descriptions may be based on observations and interviews (as the author used along the study), sometimes focusing on how the programme is perceived by participants. The effort to generate an accurate and detailed description of the programme operations, particularly lends itself to the use of qualitative methods.

Qualitative research is characterised by the following list of features (adapted from (Miles and Huberman, 1994)):

- Qualitative research is conducted through an intense and/or prolonged contact with a 'field' or life situation.
- The researcher's role is to gain a 'holistic' overview of the context under study.
- The researcher attempts to capture data on the perceptions of local actors 'from the inside'.
- Themes and expressions should be maintained in their original forms throughout the study.
- A main task is to explicate the ways people come to understand and eventually to manage their day-to-day situation.
- It is permissible to have many interpretations to the data captured while some may be more compelling on grounds of internal consistency.
- The researcher is essentially the main 'measurement device' in the study.
- Most analysis is done with words.

Blaikie (Blaikie, 2000) refers to the objective of the research as an additional differentiator for the choice of strategy. One of the objectives analysed is the one of exploration. The Webster's New Collegiate dictionary defines exploring as examining minutely especially for diagnostic purposes. In social sciences, to

explore is to attempt to develop an initial, rough description or, possibly, an understanding of some social phenomenon. Exploratory research is necessary when little is known about the topic being investigated, or when it has not been investigated in the specific context in which it is occurring. Essentially, exploratory research is used to get a better idea of what is going on and how it might be researched. The methods used to conduct exploratory research need to be flexible as the researcher may need to be creative and resourceful in gaining access to the information required. Exploratory research should provide as detailed and accurate a picture of the phenomenon as is necessary to enable the researcher to feel at home and to be able to speak about the research problem with some confidence.

If exploratory research was to attempt for a rough description of the studied phenomenon, explanatory research seeks to account for patterns in it, so that events or irregularities that have been observed, become intelligible. Blaikie also differentiates between various explanatory strategies but remarks that one of them, inductive research strategy, better lends itself to explanatory research. In the inductive research strategy, explanation is achieved by locating a particular pattern within a known and more general pattern or network of relationships (Kaplan A., 1964). The growth of knowledge is achieved by indefinitely filling in and extending the patterns. This kind of explanation has three main forms: it refers to broader patterns of which the case in point can be seen as a specific case; it identifies developmental sequences in social relationships; or it specifies certain patterns in the way interaction occurs.

The inductive strategy, a common-sense view of how scientists go about their work, starts with data collection, followed by data analysis, and then the development of generalizations that, with further testing, can become law-like propositions to be used to explain aspects of social life.

The inductive strategy has been described as consisting of three principles: accumulation (of data), induction (to produce general laws), and instance confirmation (and the further there are, the more plausible is the law). Inductive strategy has also been characterized as consisting of four main stages: Objective observation of facts, facts analysis and classification, generalizations inductively drawn, further testing for plausibility. Real life requires softening of the first stage in recognizing that any choice of concepts, and the way they are defined, predetermines what data are collected. Inductive strategy can then be used to pursue an exploratory objective to answer 'what' questions, i.e. to describe phenomena and establish regularities which need to be explained. Nonetheless, one must remember that induction, not being a 'perfect' logic, all attempts to generalize must be kept as tentative; so that consistent findings can at best support a generalization, but never prove it to be true.

The research strategies provide different ways of answering research questions by specifying a starting-point, a series of steps and an end-point. Different strategies apply differently to diverse research questions. This research's, being a 'what' question¹, calls for an inductive strategy with an explorative objective to best answer it. 'What' questions can be dealt with by making appropriate observations or measurements, i.e. collecting appropriate data, and then

¹"What are the dominant factors in the implementation of a sustainable knowledge management program in a large corporation"?

producing descriptions based on them. The observer, as an active participant in the process, cannot avoid imposing concepts and categories before a description can be produced. Blaikie argues that in the inductive research strategy, the researcher must take a 'detached observer' position and avoid allowing personal values or political commitments to contaminate the research. He claims that if objectivity cannot be achieved, then the generalizations produced cannot be trusted as representing the regularities in social life. This issue has been addressed when reference is made to action research which constitutes a basic pillar in the construction of this research.

2.2 The research philosophy

The so-called 'standard view' of science derives directly from a philosophical approach known as positivism. In this standard view, science, including social science, has explanation as a central aim. Explanation here means that if you can relate an event, observation or other phenomenon to a general law, then you have explained it (Robson, 2002). Essentially, positivists look for the existence of a constant relationship between events. When people are the focus of the study, particularly when it is taking place in a social real world context, 'constant conjunction' in a strict sense is so rare as to be virtually non-existent. Positivism, on which inductive strategy is based, entails ontological¹ assumptions about an ordered universe made up of discrete and observable events (Blaikie, 2000). It assumes that this order can be represented by generalizations about the relationships between concepts. Social reality is viewed as consisting of a complex of causal relations between events. This is usually represented as an emerging network of relations between concepts. In its epistemological² assumptions, knowledge is considered to be produced through the use of the human senses and by means of experimental or comparative analysis.

Within social science there are influential relativistic approaches (Robson, 2002). They are variants of what is commonly referred to as 'qualitative' research, as distinguished from the 'quantitative' research typical of the positivistic tradition. Within this tradition there is almost invariably a rejection of the view that 'truths' about the social world can be established by using natural science methods. This is essentially because of the nature of the subject matter of the social sciences – people. People, unlike the objects of the natural world,

¹ Two of the most central concepts in the philosophy of science are ontology and epistemology. The root definition of ontology is 'the science or study of being'. For the purpose of the present discussion, ontology refers to the claims or assumptions that a particular approach to social enquiry makes about the nature of social reality – claims about what exists, what it looks like, what units make it up and how these units interact with each other.

² The root definition of epistemology is 'the theory or science of the method or grounds of knowledge'. Again, in terms of the present discussion, epistemology refers to the claims or assumptions made about the ways in which it is possible to gain knowledge of this reality, whatever it is understood to be; claims about how what exists may be known. An epistemology is a theory of knowledge; it presents a view and a justification for what can be regarded as knowledge – what can be known, and what criteria such knowledge must satisfy in order to be called knowledge rather than beliefs (Blaikie, 1993). Questions about 'what is regarded as the evidence of things in the social world' or simply about 'what we know' are epistemological questions (Mason, 1996).

are conscious, purposive actors who have ideas about their world and attach meaning to what is going on around them. In particular, their behaviour depends crucially on these ideas and meanings. Constructivism is the trend replacing qualitative positivism in modern social sciences. Constructivist researchers consider that it is their task, to understand the multiple social constructions of meaning and knowledge. Hence they tend to use research methods such as interviews and observation which allow them to acquire multiple perspectives (this is precisely what the author did in the social inquiry that constituted the study).

Positivism or constructivism are probably the basic representatives of a list of alternative paradigms to inform and guide qualitative inquiry (Guba and Lincoln, 1994) (Miles and Huberman, 1994; Miles and Huberman, 1994). By paradigm¹, the author means the basic belief system or worldview that guides the investigator, not only in choices of method but in ontological and epistemological fundamental ways. The beliefs are basic in the sense that they must be accepted simply on faith (however well argued).

The term positivism denotes the traditional view focusing on efforts to verify or falsify a priori hypotheses, most usefully stated as mathematical (quantitative) propositions expressing functional relationships. From an ontological point of view, an apprehendable reality is assumed to exist (hence its label as naïve realism), and knowledge of 'the way things are' is conventionally summarized in the form of time- and context-free generalizations, some of which take the form of cause-effect laws. From an epistemological point of view, the investigator and the investigated 'object' are assumed to be independent entities, and the investigator to be capable of studying the object without influencing it. Inquiry takes place as through a one-way mirror. Values and biases are prevented from influencing outcomes, so long as the prescribed procedures are rigorously followed. This of course doesn't fit the situation that has been experienced by the author.

On the other hand, the term constructivism denotes an alternative paradigm whose breakaway assumption is the move from ontological realism to ontological relativism. From an ontological point of view, realities are apprehendable in the form of multiple, intangible mental constructions, socially and experimentally based, local and specific in nature, and dependent for their form and content on the individual persons or groups holding the constructions. Constructions are not more or less 'true' in any absolute sense, but simply more or less informed. From an epistemological point of view, the investigator and the object of investigation are assumed to be interactively linked so that the 'findings' are literally created as the investigation proceeds. From a methodological point of view, the variable and personal nature of social constructions suggests that individual constructions can be elicited and refined only through the interpretation of events by the investigator and the interaction between him and respondents. This has been elaborated in section 2.5 as the

¹ Pattern, example, model (Webster's New World Dictionary of the American Language).

author discusses the action research method which is usually associated with the hermeneutic paradigm¹.

Differences in paradigm assumptions cannot be dismissed as mere 'philosophical' differences; implicitly or explicitly, these positions would have important consequences for the practical conduct of the inquiry, as well as for the interpretation of the findings as it can be seen in table 2-1, from the following list of practical issues (Easterby-Smith, Thorpe, and Lowe, 2002):

Issue	Positivism	Constructivism ²
The observer	Must be independent.	Is part of what is being observed. ³
Human interests	Should be irrelevant.	Are the main drivers of science.
Explanations	Must demonstrate causality.	Aim to increase general understanding of the situation.
Research progress through	Hypothesis and deductions.	Gathering rich data from which ideas are induced.
Concepts	Need to be operationalized so that they can be measured.	Should incorporate stakeholder perspectives.
Units of analysis	Should be reduced to simplest terms.	May include the complexity of 'whole' situations.
Generalization through	Statistical probability.	Theoretical abstraction.
Sampling requires	Large numbers selected randomly.	Small number of cases chosen for specific reasons. ⁴

Table 2-1: Paradigm positions on selected practical issues

This study uses the constructivist paradigm in which the author finds a home to action research, which centralizes human behaviour, and through which he tries to generalize using a small number of cases; reality is determined by people rather than by objectives and factors, hence not only facts have been gathered but also the different constructions, perceptions and significance that people attribute to experience. The focus of the study is not about the KM implementation, but rather in what were the factors enabling it and how did it affect the people involved in it.

2.3 The research methodology

Yin (2003) remarks that many social scientists believe that case studies are only appropriate for the exploratory phase of an investigation, that surveys and histories are appropriate for the descriptive phase, and that experiments are the

¹ Hermeneutics is the 'art and science of interpretation' and since all social science research involves interpretation, insights gained from hermeneutics are relevant to many aspects of the research process (Robson, 2002).

² Constructivism is labelled as "social constructionism" (Easterby-Smith et al, 2002)

³ See section 2.5.1

⁴ See section 5.1

only way of doing explanatory or causal inquiries (Yin, 2003). This hierarchical view reinforces the idea that case studies are only a preliminary research methodology and cannot be used to describe or test propositions. Stake (1994) on the other hand, argues that a case study is not a methodological choice, but a choice of object to be studied. "We choose to study the case". As a form of research, case study is defined by interest in individual cases, not by the method of inquiry used (Stake, 1994). The author believes that the more appropriate view of these different methodologies is an inclusive and pluralistic one, and that each methodology can be used for all three purposes – exploratory, descriptive, or explanatory.

Yin compares five different methodologies (experiment, survey, archival analysis, history and case study), and relates their respective appropriateness to three conditions:

- The type of research question posed.

'What' questions seem appropriate for an exploratory purpose – the goal of the study being to develop pertinent hypotheses and propositions for further inquiry. This purpose can be answered by all five methodologies. Conversely, 'what' questions can also be about prevalence, in which surveys or the analysis of archival records would be recommended.

'Who' and 'where' questions are also likely to favour surveys or the analysis of archival records. In cases like these, the research goal is to describe the incidence or prevalence of a phenomenon or when it is to be predictive about certain outcomes.

In contrast, 'how' and 'why' questions are more explanatory and likely to lead to the use of case studies, histories, and experiments as the preferred methodology. This is because such questions deal with operational links needing to be traced over time, rather than mere frequencies or incidence.

- The extent of control an investigator has over behavioural events.

Histories are the preferred methodology when there is virtually no access or control over behavioural events. Conversely, experiments are done when an investigator can manipulate behaviour directly, precisely, and systematically.

- The degree of focus on contemporary as opposed to historical events.

Case studies are preferred in examining contemporary events, but when the relevant behaviour cannot be manipulated. In addition, case studies have additional sources of evidence over those existent in the history analysis. These are direct observation of the events studied and interviews of the persons involved in them.

As one can see from chapter 4 of this thesis, IAI's KM programme is alive and on going. Two of those methodologies – archival analysis and history are therefore ruled out for not being adequate to a research dealing with contemporary events. The experiment method cannot be used either, since the case dealt with is one of a real life industry, struggling to grow and sometimes even to survive, and that cannot be regarded as a laboratory experiment. One is therefore left with two options – surveys or case studies. The research question starts with a 'what' (*"What are the dominant factors in the implementation of a sustainable knowledge management programme in a large corporation?"*). Nevertheless, in the shadow of this question, lie two other ones – *"How is a*

knowledge management programme implemented in a large corporation?", and "Why is such a programme sustainable?"

Yin claims that case studies are considered as the preferred method when 'how' and 'why' questions are being posed, when the researcher has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. This is therefore, the methodology the author has used.

2.3.1 Case studies

A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). Chapter 4 of the thesis describes the environment in which this study takes place and explains it as contextual conditions highly pertinent to the phenomenon being studied. Case studies would be beneficial in describing and explaining the presumed causal link in real-life interventions that are too complex for the survey or experimental methodologies, or in other words would link programme implementation with programme effects (precisely what the author is after in the study). Case studies would also be used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes.

One can consider single or multiple case designs; a single case design is appropriate when it represents the critical case in testing a well-formulated theory, an extreme, unique or revelatory case, is the representative or typical case, or is to be studied longitudinally in time. Multiple-case design is a selection of two or more cases that are believed to be literal replications; they can be considered analogous to multiple experiments, that is, following replication logic. Multiple-case inquiry would focus on how and why the exemplary outcomes might have occurred and hoping for literal or direct replications of these conditions from case to case. Multiple-case design is normally generating evidence considered as more compelling, so that the study is therefore regarded as more robust. Nevertheless, each individual case study consists of a 'whole' study, in which convergent evidence is sought regarding the facts and conclusions for the case (as has been demonstrated along the study).

Stake (1994) categorizes case studies by the purpose researchers have for conducting them. One category is about *intrinsic* case studies, studies undertaken because one wants better understanding of what is happening within a particular case. It is not undertaken because the case represents other cases or because it illustrates a particular trait or problem, but because, in all its particularity, the case itself is of interest. Stake (1994) claims that this is the bulk of case study work. Another category is called *instrumental* case study in which a particular case is examined to provide insight into an issue or refinement of a theory. The case itself is of secondary interest but it is chosen because it is expected to advance the understanding of that other interest. Yet another category is called *collective* case study and it deals with instances where a number of individual cases are being studied to throw light on a common phenomenon.

Qualitative case studies are characterized by the main researcher spending substantial time, on site, personally in contact with activities and operations of

the case, reflecting, revising meanings of what is going on (Stake, 1994). A thorough analysis of a particular process requires the use of the researcher's personal observations that results from his presence, participation and even intervention in the actual process to be studied (Gummesson, 1991). Participant observation with active intervention is known as action research and has been addressed in section 2.5.

Gummesson also stresses the important advantage case studies have in the opportunity for a holistic view of a process. The detailed observations entailed in the case study methodology enable the reader to study many different aspects, examine them in relation to each other, view the process in its total environment and also utilize the researcher's capacity for '*Verstehen*'¹. Consequently, case study research provides us with a greater opportunity than other available methodologies to obtain a holistic view of a specific research project. According to the holistic view, the whole is not identical with the sum of its parts. Consequently, the whole can be understood only by treating it as the central object of the study.

Patton (1987) highlights yet another advantage for case studies and claims that they are particularly valuable when the evaluation aims to capture individual differences or unique variations from one programme setting to another or from one programme experience to another. The more a programme aims at individualized outcomes, the greater the appropriateness of qualitative case methods (Patton Michael Quinn, 1987).

2.4 The research methods

The research methods are actually the methods and ways the researcher uses in order to collect the data that would be the basis of the research. Having in mind an action research, mainly driven by the specific task of the researcher as the director of knowledge for the company and responsible for the design of the programme and its implementation, and having an excellent access to observation and documented data across the company, the concern about having a more objective source of information came-up only when considering the risk of such a research being biased. The author therefore has decided to design a questionnaire and to moderate and refine its information through interviews.

The researcher has always considered the divisions GMs as the customers of the programme, so the immediate thought was to use them as the object of the questionnaire and in such a way, to get their opinion. Only latter it was realised that an additional and not less interesting aspect would be to get the corroborating or conflicting opinion of the division knowledge managers. The

¹ Within hermeneutics and phenomenology the German word for understanding, *verstehen*, has become accepted international jargon, meaning grasping the subjective consciousness of the participants, appropriate to the study of 'human studies', as opposed to the study of natural phenomena that should seek causal explanation - *erklaren*.

Phenomenology is the philosophical study of phenomena, as distinguished from ontology. The branch of a science that classifies and describes its phenomena without any attempt at metaphysical explanations; limited to phenomena either because there is no reality beyond phenomena, or because such reality is unknowable. (Webster's New World Dictionary of the American Language).

author therefore ended with two sets of questionnaires that could be analysed separately as well as compared.

In the process of designing the questionnaire, the author has put it to test with one of the senior managers of IAI – one that previously was himself a division GM. He filled the questionnaire and the author then interviewed him to get his remarks and comments. It was at this point that the author realized the richness achievable through the verbal ambience of an interview as opposed to the structured and comparable information gotten through questionnaires. The decision the author then made was to conduct interviews as introduced in section 2.4.2.

2.4.1 Questionnaires

Robson (2002) describes the steps to be taken in the process of using a questionnaire as a gathering method for a survey (Robson, 2002):

- Development of research questions.
- Study design and initial draft of questionnaire.
- Informal testing of draft questionnaire.
- Revise draft questionnaire.
- Pre-test revised draft using interviews.
- Correct questionnaire again.
- Distribute questionnaire and collect answers.
- Analyse data.

The typical central features of this type of survey are the use of a fixed, quantitative design, and the collection of a large amount of data in standardized form from all the population involved. Survey research entails the collection of data on a number of units and usually at a single juncture in time, with a view to collecting systematically a body of quantifiable data in respect of a number of variables which are then examined to discern patterns of association (Bryman, 1989) cited by (Robson, 2002).

Surveys in general provide a relatively simple and straightforward approach to the study of attitudes, values, beliefs, and motives; they are enabling the collection of generalizable information; and they provide high amounts of data standardization. On the other hand, ambiguities or misunderstandings of the survey questions, and respondents not treating the survey seriously may be at the detriment of the information gathered. Also, data could be affected by the characteristics of the respondents (their memory, knowledge, experience, motivation, and personality); and by their preference of being shown in a good light (the questionnaires the author used were not anonymous). The questionnaire's length (and in this case it was particularly long), and organisation (a self completing closed questions set was used) are also important to the internal validity of the survey but in general, one can trust that by presenting all respondents with the same standardized questions, it is possible to obtain high reliability of response.

The validity, the reliability, and the generalizability of the data gathered through the questionnaire are issues to be considered in spite of the approach taken by some researchers and cited by Robson denying the relevance of reliability and

validity for qualitative flexible design (Robson, 2002). Validity is a question of how far one can be sure that a test measures the attribute that it is supposed to measure. In this context, validity can be defined as "the capacity of a test to tell us what one already knows" (Easterby-Smith et al, 2002). Nevertheless, there are various ways of estimating validity; 'face validity' refers to the plausibility of the test at stake – the questionnaire. The number of questions – over 110, their organisation in four distinctive groups (described in chapter 5), the limited choice in closed questions, the cover introduction letter attached to it, and mainly the personal relationship existing between the researcher and the respondents, make the questionnaire data relatively plausible (see also (Sieber, 1973)). Another aspect is the one of 'convergent validity' – confirmation by comparing the instrument with other not related measurement procedures. This is done while adding the dimension of personal observations and also through interviews conducted in the five selected cases. Finally there is 'validation by known groups' – comparing groups otherwise known to differ on the factor in question. This has been done by triangulation as described in chapter 7. Robson recommends triangulation to enhance the rigour of the research. The author would apply data triangulation by using more than one method of data collection (questionnaires, interviews, documented PDM and mutual assessment results, and personal observation).

Robson (2002) discerns the main threat to description validity as inaccuracy or incompleteness of the data. The main body of data coming from written answers to a questionnaire, one can see this threat as inexistent. The main threat he sees to interpretation validity is in imposing a framework or meaning on what is happening without proper justification. The author has demonstrated in chapter 6 proper justification for the proposed factors.

Another threat to validity addressed by Robson is the one of researcher bias. The search for negative cases is an important means of countering this bias and this is reported in chapter 7. Besides, the process of implementing KM in the company being transparent and monitored by the various management levels, has been demonstrated as a means to defuse the researcher bias threat. Reliability is primarily a matter of stability: if a test is administered to the same individual on two different occasions the question is, will it yield the same results? The main problem with testing this in practice is that no one can be sure that the individual, and other factors, have not changed between the two occasions. Hence it is more common to examine 'equivalence reliability', which is the extent to which different items intended to measure the same thing correlate with each other. The best the author could do for that matter was to conduct the GM questionnaire distribution (and similarly the knowledge manager's and the interviews) in parallel and during a limited period of time so that the conditions would be equivalent and that they would be comparable. The author also checked on the reliability of the questionnaires using some of Goode's methods (Goode and Hatt, 1952) relating to the proportion of questions not answered, 'Not applicable' answers, or series of similar answers and these are presented in section 6.2.1.

Generalization has been based on the judicious choice of the divisions as cases to be studied (described in chapter 5) and on the checking across additional divisions to look for negative cases (described in chapter 7). This is dependent

of course on the quality of the descriptive or analytical language by means of which one would grasp the interaction between various parts of the case divisions and their important characteristics (Gummesson, 1991).

Easterby-Smith summarizes the criteria for validity, reliability, and generalizability from a constructionist viewpoint as (Easterby-Smith et al, 2002):

- Validity – Does the study clearly gain access to the experiences of those in the research setting? The author believes that the wide access to the participants of the survey and to their experience has been demonstrated.
- Reliability – Is there transparency in how sense was made from the raw data? The author has described as clearly as possible the conclusions and how they are being reached in chapter 7.
- Generalizability – Do the concepts and constructs derived from this study have any relevance to other settings? The author refers this issue to further studies as proposed in section 8.4.1.

2.4.2 Interviews

To moderate and colour the information gotten from the structured questionnaires the author has used a semi-structured interview of the GM together with his knowledge manager for the five divisions picked as case studies (the process of their choice is addressed in section 5.1). Robson (2002) uses the term semi-structured to identify an interview in which there are predetermined questions, but their order and wording can be changed, explanations can be given, and additional questions could be added or omitted. "The human use of language is fascinating both as behaviour in its own right, and for the unique window that it opens on what lies behind our actions" (Robson, 2002). Fontana calls interviewing – the art of science; "being one of the most common and powerful ways one would use to try to understand our fellow human beings" (Fontana and Frey, 1994). Easterby-Smith argues that interviews are appropriate methods when it is necessary to understand the constructs that the interviewee uses as a basis for his opinions and beliefs about a particular matter or situation and when the researcher wishes to develop an understanding of the respondent's 'world' so that he could influence it as in the case of action research (Easterby-Smith et al, 2002).

In parallel to providing additional information to what was gathered through the questionnaires, the interviews have been used to enable a structured conversation between the GM and his knowledge manager. The group interview is essentially a qualitative data gathering technique that asks the interviewer to act as a moderator, to manage the dynamics of the group being interviewed, and to direct the interaction and inquiry in an unstructured way depending on the interview's purpose. The purpose in this case was phenomenological as well as instrumental to improve the rapport between the GM and the knowledge manager.

The interviews were all conducted four to five months after the questionnaires were returned so that they have had the opportunity to think about the subject (while answering it), but were not defensive about their answers. The content,

announced in advance to the interviewees, consisted of three subjects¹ to be discussed in a given order.

The meeting started with the interviewer reminding the interviewees about the questionnaire they have completed a few months ago, stating of course that it has been kept in strict privacy and obviously was not disclosed to each other. The questionnaires being similar, though not duplicates, it opened an opportunity for the common subjects covered by it to be discussed. The three subjects of interest were reminded so that the interviewees could plan ahead their positions, and the interviewer started by asking the first question, leaving it open as to who would be the first to answer. The main task the interviewer has, apart from keeping the process in control and guiding it to productive areas, is to listen. The author did expressly that, making sure that each of the interviewees had an opportunity to express himself. Patton claims that the fundamental principle of qualitative interviewing is to provide a framework within which respondents can express their own understandings in their own terms (Patton Michael Quinn, 1987). In a group interview, the interviewer must be flexible, objective, empathic, persuasive, and a good listener. The interviewer must keep one person from dominating the group, he must encourage recalcitrant respondents to participate, and he must obtain responses from the entire group to ensure the fullest possible coverage of the topic (Fontana and Frey, 1994). Interviewers could also face the situation in which respondents may not wish to divulge sensitive information; for example, what their motives are. This could be particularly relevant to this case where the GM and the subordinate knowledge manager are present in the same interview. The excellent rapport existing between the researcher and the respondents (from both groups) is such that this risk is minimized. Goode addresses an additional element of social interaction – insight or intuition (Goode and Hatt, 1952). He refers to the subliminal cues that could be occurring in such an interaction and that could pass unnoticed if not for the sensitivity of the interviewer. The researcher should consciously develop alertness for them, attempt to 'read' them, and react accordingly. The matter complicates when one realizes that interviewees also have insight (particularly in a group interview, and predominantly when, as in this case there is a subordinate relationship between the respondents). The task of the researcher then is to create a relaxed atmosphere in order to help the people present express themselves freely. One has yet to remember that the interview is not simply a conversation, but rather a pseudo-conversation. In order to be successful, it must have all the warmth and personality exchange of a conversation, with the clarity and guidelines of scientific searching.

2.5 Action research and its implications

Action research is considered as the most demanding and far-reaching method of doing case study research (Gummesson, 1991). Gummesson follows (Argyris, Putnam, and McLain Smith, 1985) and calls it *action science* the characteristics of which are:

¹ Stated in section 5.6.1.

- Action science always involves two goals: to solve a problem (in this case, to the company the author belongs to), and to contribute to science.
- During an action science project those involved – the researcher and the company's personnel, should learn from each other and develop their competence (as detailed in chapter 4).
- The understanding developed during an action science project is holistic and the researcher must focus on the totality of the problem. This has been demonstrated in chapter 6 where the author researches the factors involved with the process.
- Action science requires cooperation between the researcher and the company's personnel, feedback to the parties involved, and continuous adjustment to new information and new events as performed along this research.
- Action science is primarily applicable to the understanding and planning of change in social systems, and the implementation of knowledge management in an organisation isn't but a social system.
- There must be a mutually acceptable ethical framework within which action science is used (see also (Easterby-Smith et al, 2002)). The task of the author as a researcher was not published in IAI (though some of the participants were aware of it) but researching the issue of the implementation of knowledge management was itself legitimate for somebody as the director of knowledge.
- Pre-understanding of the corporate environment and of the conditions of business is essential when action science is applied to management subjects and this is inherent to the practical background of the author.
- Action science should be governed by the hermeneutic paradigm. The great advantage of action research is that it provides the researcher with substantially improved access to data. The great problem is how to unite the roles of researcher and having an active role in the organization researched since the action researcher actually professes a loyalty to both knowledge and to the objectives of the practitioner. Practice involves the use of previously acquired scientific knowledge just as research gains from experience in practice. This reflects the hermeneutical spiral of pre-understanding, understanding, pre-understanding, and so forth in a never-ending chain.

Kurt Lewin was the first to use the term 'action research' (Lewin, 1946) cited by (Robson, 2002), (Lewin, 1946 cited in Burnes, 2004a p.983). He viewed it as a way of learning about organizations through trying to change them. Robson as well, differentiates it in terms of its purpose, which is to influence or change some aspect of whatever is the focus of the research. Improvement and involvement are considered central to action research; first, the improvement of the understanding of a practice of some kind by its practitioners, then, the improvement of the practice, and finally, the improvement of the situation in which the practice takes place (order of events changed from the one presented by Robson).

It is being claimed that while the natural sciences first generate pure research findings and then apply them, social sciences make theoretical progress only

through application (Trist,1976, cited in Robson, 2002, p.10). The argument is that the only way to get the proper access needed to study people in real life settings is through proving one's 'competence in supplying some kind of service'. Hence, practice helps to improve theory, which in turn helps to improve practice; and this is the 'action research' perspective.

2.5.1 The double hat of the author

One has to remember that the author of this thesis is actually wearing two hats. On one side, he has been the original and main designer of the programme, he has led it ever since its very beginning and he is responsible for its implementation. On the other, he is researching it in order to find the main factors liable of being instrumental in its implementation. Outcomes of the programme are obviously used as inputs for the research. What is less obvious but no less effective is that sometimes, actions related to the research are influencing the programme. This was the case when the author distributed the questionnaires to the GMs and the knowledge managers, and also when he interviewed them. The questionnaires distribution took place during the first quarter of 2005, in parallel with two events, the annual mutual KM assessment, and the validation and update of the knowledge handbook (described in chapter 4). The result was twofold – the knowledge managers answered the questionnaire right after being interviewed for the validation session, and the GMs the author met along the assessment, were much more aware of the programme and therefore better responsive. The interviews took place between the end of the second quarter of 2005 and the beginning of the third one, having in their background the result of the mutual assessment, and the analysis of the KM programme implementation across the company, conducted at the T50 level in July of 2005. The author met at these interviews managers with a better perspective of where their division is with respect of the company's average. Interviews were therefore used both to refine questionnaire information, but also to improve and strengthen the relationship between the GMs and their knowledge managers.

2.5.2 Risk associated with action research

Action research does not limit itself to the understanding of the process and communicating it, but includes participating, using this understanding to suggest ways in which desirable change might take place, and even monitoring the effectiveness of these attempts, so that it actually amounts to 'self-evaluation'. This is a quite controversial situation. At one extreme, some would doubt the feasibility of insiders carrying out any worthwhile, credible or objective enquiry into a situation in which they are centrally involved. At the other extreme, arguments would be that outsider research is ineffective, at least as far as change and development is concerned.

Miles and Huberman caution for two sources of bias that could perturb the researcher's task – one is the effects of the researcher on the case and the other is the effects of the case on the researcher (Miles and Huberman, 1994). The first bias is especially relevant when the researcher is, as in this case, in charge of the programme he is researching. To minimize the risk the author has

based the study mainly on objective data. The second bias is lessened by multiplying the sources of information for each division.

Ottosson uses the term participation action research and claims that researching management and especially change management would be very difficult if not impossible without the application of action research (Ottosson, 2003p. 91). This is because development processes are generally very complex and unique in any organisation; they are truly irreversible so that the formulation of standard solutions is impossible. Reliable information needs then to be based on unfiltered daily interaction and unspoken information between the researcher and the studied process. Participation action research is more demanding than classical research; therefore researchers must have good emotional skills, appropriate experience and knowledge, and good personal skills for the work. Broad personal knowledge and skills are especially important when researchers act as managers (as in the author's case), since dialogues are often spontaneous.

The author has addressed those risks by the following ways:

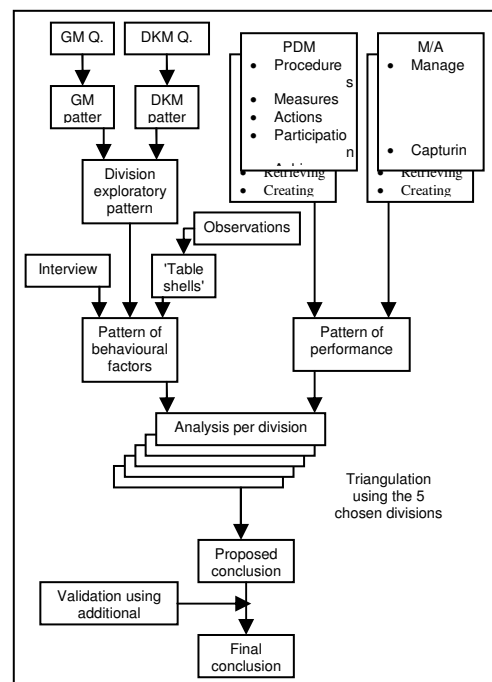
- The research is conducted on a programme which is fully transparent and published on the IAI-Net, inclusive of its performance, its targets and results, and the scores of its mutual assessment.
- The programme is being monitored by different levels of management, starting with the knowledge manager at the division level, through the director of knowledge, the VP for R&D and Strategy, and ending with the T50 level.
- The divisions chosen for the case studies are representing four of the five groups of IAI and corporate divisions as well. They include successful division in the implementation and less successful ones (see section 5.1).
- The data collected mainly comes from questionnaires and from published PDM targets and results, as well as from the mutual assessment scores. The personal observations of the author only add colour to this objective data.

2.6 The research environment

The research is being conducted on a case. For the researcher to identify the case it must be put within the perspective of its environment. Researching and analysing the case may lack a great deal of significance if one is not aware and understands the environment in which this case is performing. The case is actually a bounded system, but first of all it is a system, it has parts that interconnect and function in view of the environment wrapping it. Its behaviour is patterned and the recognition of these patterns is one of the goals of the study. Some of those features are significant as context. "It is not always easy to say where the case ends and where the environment begins" (Goode & Hatt, 1952, cited in Stake, 1994, p.236). Cases have a few dimensions and they all have to be defined and bounded. The definition of divisions as cases specifies them as social and physical settings. The temporal limitation is the research period defined as the years 2003 and 2004. At any rate, the boundedness and the behaviour patterns of the system are key factors in understanding the case.

2.7 The research analysis

The author has used what Miles and Huberman (1994) call 'transcendental realism' in the approach to data analysis for this study. This means that phenomena (including social phenomena) "exist not only in the mind but also in the objective world – and that some lawful and reasonably stable relationships are to be found among them" (Miles and Huberman, 1994). The author has been looking for explanations to relate structures to observed effects. This calls both for causal explanation and for evidence showing that each entity is in instance of an explanation. So what is needed is not only the explanatory structure or mechanisms, but also knowledge of the particular set of circumstances. One can use thematic analysis for the generation of those explanatory structures and their relation to circumstances. A theme is a pattern found in the information that at minimum describes and organizes the possible observations and at maximum interprets aspects of the phenomenon (Boyatzis, 1998). The ability to use thematic analysis involves a number of competencies. First there is the ability of the researcher to recognize what is important. Another competency could be called 'pattern recognition', or 'seeing' a pattern out of random information. Then, there is 'openness' or conceptual and sustainable flexibility for the patterns perceived. Finally, the researcher should have the 'system thinking' to provide him with the ability to organize the patterns into a 'usable system' – an entity that could be used consistently at other times. The outcome of such a process would be a set of patterns as described in chapter 7 (figure 7.1 attached hereby shows the analysis process).



2.7.1 Data reduction

The process started before any data was collected. The author has decided to focus the study on two of the main actors involved in the implementation of knowledge management in IAI – the general managers of all the divisions and their respective knowledge managers. The author has presented the function of the other actors – the company's director of knowledge and the division's entity which represent the environment for the case, but data hasn't been collected to support it. In the construction of the questionnaires which have been the main tool for data collection (described in chapter 5), the author has used a structure grouping data around the four basic questions – why, what, how and when is KM being implemented in the division. Data originating from the PDM (described in section 5.3) consists of documented information about the objectives, measures, and actions as chosen and performed by the specific divisions picked as cases to be studied for this research. Data originating from

the self and mutual assessment (described in section 5.4) consists of documented information about the result of assessment exercises performed during the research period in the specific divisions picked as cases to be studied for this research. Personal observation data collected by the author (sample of which appears in appendix 12), has been organized in 'table shells' along his activity as director of knowledge introduced in section 6.2.2 and partially shown in appendix 13 (as recommended by (Yin, 2003)).

Miles and Huberman (1994) emphasize that this data collection is actually part of the analysis because decisions about what to select and to summarize, and how this is then to be organized, are analytic choices.

2.7.2 Data display

The author has summarized the data collected for the case study divisions in a set of documents (see chapter 7) labelled:

- Pattern of behavioural factors.
- Pattern of performance.

This was done under the caution prescribed by Robson about some of the deficiencies of 'human analysis' (Robson, 2002), namely:

- Internal consistency causing a tendency to ignore the novel and the unusual.
- First impressions creating a notion resistant to being revised. The author suggests that these two potential deficiencies were taken care and mitigated by the rigorous structure of the documents.
- Positive instance creating a tendency to ignore information conflicting with hypotheses already held, and to emphasize information that confirms them. The author has dealt with this risk by including among the case study divisions some that are less successful than others and by validating the results with additional divisions (as described in chapter 7).
- Uneven reliability caused by the fact that some sources are more reliable than others. This was reduced through the use of multiple data sources for each division.
- Confidence in judgement, meaning that excessive confidence tends to be rested in one's judgement once it is made. The author has attempted to overcome this deficiency using the additional refinement stage following the interim conclusions of the division exploratory pattern.

2.7.3 Conclusions drawing and verification

Conclusions are essentially starting to appear, even if unconsciously by the researcher, ever since the first data is gathered. Patterns, regularities, possible structures and mechanisms start to conceive until being challenged by additional data coming from other divisions. This is continuously being verified (validated and checked for reliability), making sure that explanations are plausible and that there is evidence confirming it.

Having drawn the division exploratory pattern out of the information received from the GMs and DKMs questionnaires, the author has used a two stages process for the drawing of the pattern of behavioural factors, and based the second one on interview information and on his personal observations. The

pattern of performance was then combined into it to create the analysis conclusions per division. These were then triangulated among the five case study divisions. The result consists of the proposed conclusions of the study, validated using additional divisions, so as to verify for confirming or disconfirming instances as drawn in chapter 7.

2.8 Chapter's overview

Alternative types of designs have been examined, and have shown the rationale for choosing a flexible design associated with a qualitative strategy. The objective of the research being explanatory, an inductive research strategy is chosen as being more appropriate.

The author has looked at alternative philosophical approaches to research and has shown that social inquiry is appropriate for the suitability of the constructivist approach.

Comparing different methodologies the author has opted for case studies to guide his steps in the research based on its context within an industry with contemporary events and on the type of research question he has posed.

The research deals with process evaluation and for this the author used a detailed description of programme operations and results. He has gathered information about the perception of two of the main actors in the process of KM implementation – the division GMs and their respective knowledge managers, using questionnaires presented to them. He has then compared this information with the more objective one coming from the documented PDMs and the mutual assessment the divisions are going through to consider the maturity of the implementation process. The author has then refined the results through a semi-structured group interview conducted with those two main actors and his personal observations.

All this was done by the researcher who is also holding the position of director of knowledge for the company, who has designed the programme and who has been leading it during the last three years. This is a typical case of action research, and its peculiarity as well as the risks associated with it have been examined and addressed.

Considering the fact that cases are occurring within an environment that influences them, the author has discussed possible environment affects and particularly the cultural component of the environment.

The author has then presented the analysis portion of the research including its data reduction part, the data display and the conclusions drawing and verification exercise to confirm its validity and reliability basis.

3 Literature Review

"The mind is the man, and knowledge mind; a man is but what he knoweth..."
(Bacon, 1561-1626, cited in Durant, 1926, p.87)

This chapter starts with the definition and explanation of the basic notions used in this research, being knowledge and knowledge management. It then explores the subject of implementation of knowledge management, including examples from some benchmark industries. Finally it relates to the issue of measurement of knowledge management, to realize its shallowness in the existing literature.

3.1 Change

Lewin maintained that to understand any situation it was necessary that "one should view the present situation – the *status quo* – as being maintained by certain conditions or forces¹" (Lewin, 1943, p.172 cited in Burnes, 2004a p.981). In this context, Lewin related to *group dynamics*², while his definition of a group "is not the similarity or dissimilarity of individuals that constitute a group, but interdependence of fate³" (Lewin, 1939, p.165 cited in Burnes, 2004a p.982).

As opposed to Lewin's planned approach to change, other school of thoughts emerged during the last twenty years of the 20th century. For proponents of the 'culture-excellence' school, the world is essentially an ambiguous place where detailed plans are not possible and flexibility is essential. "Instead of close supervision and strict rules, organizational objectives need to be promoted by loose controls, based on shared values and culture, and pursued through empowered employees using their own initiative" (Watson, 1997 cited in Burnes, 2004b p.988). Alternatively, 'processualists' reject prescriptive, recipe-driven approaches to change and are suspicious of single causes or simple explanations of events. Instead, when studying change, they focus on the inter-relatedness of individuals, groups, organizations and society. The newer approaches to change, tend to take a holistic/contextual view of organizations and their environment; they challenge the notion of change as ordered, rational and linear processes; and there is an emphasis on change as a continuous process which is heavily influenced by culture, power and politics (Watson, 1997 cited in Burnes, 2004b p.988).

Complexity theories are increasingly being used by organization theorists and practitioners as a way of understanding and changing organizations. These theories come from the natural sciences, where they have shown that disequilibrium is a necessary condition for the growth of dynamic systems. For organizations, as for natural systems, the key to survival is to develop rules which are capable of keeping an organization operating "on the edge of chaos".

¹ The author does it in addressing what he calls 'the environment' in section 3.3.6.

² The word dynamics comes from a Greek word meaning force. "Group dynamics refers to the forces operating in groups; it is a study of these forces; what gives rise to them, what conditions modify them, what consequences they have, etc." (Cartwright, 1951, p.382 cited in Burnes, 2004a p.982).

³ In the implementation of change within IAI, the notion of togetherness as a group was of essence and has been the reason for the institution of the 'One Company' value.

"If organizations are too stable, nothing changes and the system dies; if too chaotic, the system will be overwhelmed by change. In both situations, radical change is necessary in order to create a new set of order-generating rules which allow the organization to prosper and survive" (Watson, 1997 cited in Burnes, 2004b p.988).

At the core of any major change programme is the process of strategy choice and formulation. Preparation for implementation will be more effective if the 'stakeholders' involved with the changes have been identified, if the impact of change on them has been assessed, and if they have been involved in the diagnosis and planning where possible and appropriate (Carnall, 1995). Three necessary conditions for effective change are suggested:

- Awareness of the stakeholders and their understanding and belief of the vision, strategy, and implementation plans.
- Capability of the stakeholders to believe they can develop the necessary skills to take advantage of the changes.
- Inclusion of the stakeholders in the value for the new position they will hold after the change, so that they would actually choose to fit in them.

Carnall (1995) proposes phrasing out the capability of creating change as:

$$EC = D \times K \times V$$

where EC is the energy for change, D is the dissatisfaction with the present situation, K is the knowledge of what needs to be done, and V is the shared vision of what is expected.

Rosabeth Moss Kanter (1992) has delineated a list of processes necessary in an innovating change process (Kanter, 1992):

- Power and innovation to the people with the will of leading the change.
- Problem definition: gathering information for saleable innovations.
- Coalition building: from cheerleading peers, 'horse trading', to blessings from the top.
- Mobilization and completion: keeping the action phase active, handling opposition and blocking interference, maintaining momentum, secondary redesign, and external communication.

3.2 Knowledge management

3.2.1 The definition of knowledge

Plato defined knowledge as "justified, true belief". This is the venerable definition of many philosophers, also adopted by Nonaka and Takeuchi (Nonaka and Takeuchi, 1995, p.58). This definition identifies three individually necessary and jointly sufficient components of what counts as infallible propositional knowledge: a truth condition, a justification condition, and a belief condition.

Other definitions for knowledge, gathered by Firestone and McElroy (Firestone and McElroy, 2003a, p.3) include:

- "Knowledge is understanding based on experience" – this is the standard definition found in English language dictionaries. (The Merriam Webster

dictionary: "The fact or condition of knowing something with familiarity gained through experience or association").

- "Knowledge is experience or information that can be communicated or shared" (Allee, 1997).
- "Information in context" – meaning that information is knowledge when and if (because) it is validated by consistency with its context (Aune, 1970 cited in Firestone and McElroy, 2003b).
- "Knowledge, while made up of data and information, can be thought of as much greater understanding of a situation, relationships, causal phenomena, and the theories and rules (both explicit and implicit) that underlie a given domain or problem" – stressing its understanding content (Bennet and Bennet, 2000).
- "Knowledge can be thought of as the body of understandings, generalizations, and abstractions that we carry with us on a permanent or semi-permanent basis and apply to interpret and manage the world around us" – a capability for interpretation (Wiig 1998).
- "The most essential definition of knowledge is that it is composed of and grounded solely in potential acts and in those signs that refer to them" – a pragmatic approach to knowledge (Cavaleri and Reed, 2000).
- "Knowledge is the capacity for effective action" - (Argyris, 1993)
- "Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. In organizations it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms" – (Davenport and Prusak, 1998, p.5).

3.2.2 The definition of knowledge management

As is often the case with emerging fields of professionalism, much of what today passes for knowledge management, has its origins in practice. This uncertain progression from a casual and empirical stance to a more theoretically informed one is a well-established phenomenon. The potential for leveraging is the great advantage that abstract science-based knowledge enjoys over more empirical practices. Such knowledge can have relevance and can be applied over a much wider and more diverse range of circumstances.

3.2.2.1 Epistemological approach

It has been claimed that the epistemology of knowledge can be classified into two dimensions (Assudani, 2005, p.34):

- Epistemology of possession: knowledge is something that is possessed by the firm and is demonstrated by both:
 - Something that the firm has (resource/asset), or in other words, as knowledge 'of' the firm; and
 - Something that the firm generates (new knowledge created) and possesses thereafter as learning or innovation, or in other words, as knowledge 'from' the firm.
- Epistemology of action/process: knowledge as a dynamic process.

Firestone and McElroy see knowledge management as knowledge process management; that is the management of knowledge production, knowledge integration, the Knowledge Life Cycle¹, and their immediate outcomes (Firestone and McElroy, 2003a, p.61). In comparison to this they bring in definitions of other scholars:

- A synthesis of IT and human innovation (Malhotra, 1998).
- Management of information and/or management of people (Sveiby, 1998, cited in Firestone and McElroy, 2003a, p.64).
- The art of transforming information and intellectual assets into enduring value for an organization's clients and its people (Knapp, Ellen (PWC) 1998, cited in Firestone and McElroy, 2003a, p.65).
- Knowledge management in organizations must be considered from three different perspectives (Wiig, Karl 1998, cited in Firestone and McElroy, 2003a, p.66):
 - Business perspective – focusing on why, where, and to what extent the organization must invest in or exploit knowledge.
 - Management perspective – focusing on determining, organizing, directing, facilitating, and monitoring knowledge-related practices and activities required to achieve the desired business strategies and objectives.
 - Hands-on operational perspective – focusing on applying the expertise to conduct explicit knowledge-related work² and tasks.
- Consists of activities focused on the organization gaining knowledge from its own experience and from the experience of others, and on the judicious application of that knowledge to fulfil the mission of the organization (Wenig, Gregory R. 1998, cited in Firestone and McElroy, 2003a, p.67).
- Processes of capturing, distributing, and effectively using knowledge (Davenport, Tom 1998, cited in Firestone and McElroy, 2003a, p.68).

A more formal definition of KM, given by the American Productivity and Quality centre, is "the strategies and processes of identifying, capturing, and leveraging knowledge" (Manasco, 1996, cited in Wong and Aspinwall, 2004, p.93).

Dave Snowden (1999) identifies two distinct schools of thought in knowledge management – one associated with a mechanical metaphor, where the organization is seen as something that can be understood and prescriptive models can be created that will produce consistent and beneficial behaviour; and the other associated with an organic metaphor, seeing each organization and its environment as a unique complex ecology comprising multiple inter-dependent and inter-causal units (Snowden, 1999).

It has been claimed that knowledge management could be seen as expressing a metaphorical perspective of the company and its management and working methods, and depending on which perception of knowledge the analysis is based on, its characteristics will change (Christensen and Bang, 2003). Different perspective here means different epistemologies:

- Artefact epistemology.

¹ Introduced in section 3.2.5.1.

² "To produce works, one must have knowledge" (Durant, 1926, p.93).

The artefact-oriented epistemology (Conklin, 1996, cited in Christensen and Bang, 2003, p.122) is characterized by knowledge management focused on collecting and sharing formal data and information such as documents, reports, statistics, etc. This kind of knowledge management found its way onto the management-related agenda of the mid-twentieth century when the view was that organizations may be perceived as open systems which by creating knowledge, formulate more and more precise representations of the surrounding world.

- Process epistemology.

The process-oriented epistemology considers knowledge creation and sharing as a continuous process between people and technology as well as tacit and explicit knowledge. The Nonaka's SECI model is typical to this view but many others also adhere to it (as Prahalad and Hamel, 1990).

- Autopoietic¹ epistemology.

Autopoietic epistemology requires an untraditional organizational understanding of interaction with the surroundings as it presumes that information and knowledge may not be transferred from one system to another. Communication takes place through data, which thus represents potential information and knowledge. The interpretation of this information and data is determined by the system's own framework of understanding as the acknowledgement converting the data into knowledge depends on the existing knowledge of the system. The focus is therefore on self-reproductive systems meaning that it is only the system itself, which is capable of maintaining itself through internal processes. To create knowledge, people must be induced in sending data to others, by the interest they have about receiving data from others (see also (Koskinen, 2004, p.14)).

3.2.2.2 Ontological approach

Ontologies provide a simplified and explicit specification of a phenomenon that one desires to represent (Gruber, 1995, cited in Holsapple and Joshi, 2004, p.593). Ontologies are useful because they explicate components that define a phenomenon and, thus, can help in systematically understanding or modelling that phenomenon. In search of an ontology of knowledge management, Holsapple and Joshi (2004) have established:

- A list of knowledge management conduct levels:
 - Personal knowledge management.
 - Organizational knowledge management.
 - Trans-organizational knowledge management.
 - National knowledge management.
- A list of knowledge attributes:
 - Mode (tacit, explicit).

¹ Autopoiesis (Maturana and Varela, 1980, cited in Christensen and Bang, 2003, p.125), is a theory rooted in neurobiology, that was later developed into a theory about social systems such as employees, project teams, or organizations and about knowledge management and the composition and structure of social, self-organized systems by von Krogh and Roos (1995). Within this theory, each unit determines its boundary through self-reproduction. This self-referential nature is quintessential to the autopoietic system (see also (Nonaka and Takeuchi, 1995, p.76)).

- Type (descriptive, procedural, reasoning).
- Perishability (rapid, none).
- Accessibility (private, public).
- Applicability (global, local).
- Immediacy (actionable, latent).
- Orientation (domain, relational, self).
- Knowledge has been recognized as an important class of organizational resources (Drucker, 1993), and is increasingly being regarded as a basis for organizational competitiveness (Holsapple and Singh, 2001).
- A list of knowledge primary activity classes constitute the 'knowledge chain model', takes place within KM episodes and is given in table 3-1 (Holsapple and Singh, 2001 cited in Holsapple and Jones, 2004b, p.157).
- A list of knowledge management influences:
 - Managerial (leadership, coordination, control, measurement).
 - Resource (human, material, financial, knowledge).
 - Environmental (time, markets, competition, technology, fashion, climate – governmental, economic, political, social, or educational).

Activity class	Description
Acquisition	Acquiring knowledge from external sources and making it suitable for subsequent use
Selection	Selecting needed knowledge from internal sources and making it suitable for subsequent use
Generation	Producing knowledge by either discovery or derivation from existing knowledge
Assimilation	Altering the state of an organization's knowledge resources by distributing and storing acquired, selected, or generated knowledge
Emission	Embedding knowledge into organizational outputs for release into the environment

Table 3-1: Primary activity classes in the knowledge chain model

3.2.3 KM generations

In expressing his own misgivings with first generation knowledge management, Peter Senge explained that "...the first wave of KM hasn't been about knowledge at all. It's been about information – how to capture it, store it, retrieve it, access it, and all that stuff..." (Karlenszig, 1999, cited in McElroy, 2000). In practice, first-generation KM schemes have been solely devoted to enhancing the performance of day-to-day business processes by workers. It has been answering the following questions:

- Where do employees turn for needed information?
- Is the knowledge readily available?
- How long does it take to get it?
- Do they tap their relationships with other workers for it?
- Has technology been effectively placed at their disposal?
- Is their knowledge source current?
- Is it complete?

- Is it helpful?

It's all about getting the right information to the right people at the right time so that they can do their job more effectively (McElroy, 2000, p.199).

The author claims that first generation knowledge management could be associated with the concept of organizational memory. Organizational memory (OM) has come to be a close partner of knowledge management, denoting the actual content that a KM system purports to manage (Schwartz, Divitini, and Brasethvik, 2000). OM is making recorded knowledge retrievable and making individuals with knowledge, available. It is an explicit, disembodied, persistent representation of the knowledge and information in an organization.

While first-generation schemes have concentrated on the 'supply' of existing knowledge and information throughout the organization, second-generation strategies focus, instead, on satisfying organizational 'demand' for new knowledge. Supply-side schemes take the best organizational thinking, codify it in various forms, and then distribute it through databases, documents, training or other methods – all of this with intentional imitation in mind. Demand-side schemes focus instead, on creating and maintaining the conditions required for optimum production of new knowledge (i.e. knowledge in practice).

3.2.4 KM strategy

Many scholars have argued that technology alone is not sufficient to support KM. Current research on KM is characterized by the awareness that both technological and human aspects are essential to understand knowledge dynamics. A model has been developed to analyse the KM strategy implemented by a company (Garavelli, Gorgoglione, and Scozzi, 2004). The model distinguishes between two opposite strategies – *knowledge markets* and *knowledge communities*, and identifies the organizational form best suited to manage knowledge. Several knowledge-based organizational structures are considered such as the *spider's web* (Quinn, Anderson, and Finkelstein, 1996), or the *cellular organization* (Miles, Snow, Mathews, Miles, and Coleman, 1997). The main actors of an organization that works as a *knowledge market* are single specialists, who act as 'nodes of competencies'. Relationships within *knowledge markets* are mostly competitive and the exchanged knowledge is mainly explicit. *Knowledge markets* are suitable for solving complex customer problems on which many specialists have to work simultaneously. A *knowledge market* should be more appropriate for companies that work in a very unstable environment with technologies that are not mature and products and innovations¹ that are mostly autonomous. A knowledge market is more easily reconfigurable, based on short-term relationships and highly competitive, so it is best suited for markets that have these properties.

¹ "How do Japanese companies bring about continuous innovation? One way is to look outside and into the future, anticipating changes in the market, technology, competition, or product. Living in a world of uncertainty worked in favour of Japanese companies, since they were constantly forced to make their existing advantages obsolete. This trait, the willingness to abandon what has long been successful, is found in all successful companies, not only those in Japan" (Nonaka and Takeuchi, 1995, p.5).

In a *knowledge community*¹, knowledge is distributed among the individuals and it emerges through the organization action. Individuals interact because of the existence of social and organizational constraints, which gives meaning to action, motivates work and makes them collaborate rather than compete among each other. The establishment of organizational routines makes tacit knowledge as the prevalent knowledge type exchanged among individuals involved in the community. This kind of organization can thus be described through the *cellular model* proposed by Miles *et al.* (1997).

3.2.5 KM frameworks

Implementing KM remains a challenging task for organizations and as (Drucker, 1993), a father of modern management theory, has asserted, one of the most important challenges facing organizations in a contemporary society is to build systematic practices for managing knowledge. A study by the American Productivity and Quality Centre (APQC, 1997, cited in Amaravadi and Lee, 2005, p.66) concluded: "If you do not have a knowledge management strategy, a *framework*, and an information technology to support it, ...you end up in chaos" (framework in italic for emphasis by the source).

(Wong and Aspinwall, 2004) have researched KM *implementation* frameworks, to be distinguished from KM frameworks. According to (Popper, 1994, cited in Wong and Aspinwall, 2004, p.94), a framework is a set of basic assumptions or fundamental principles of intellectual origin that forms the underlying basis for action. For Wong and Aspinwall, a KM implementation framework is "a structure or a set of guiding principles which is depicted in such a way as to provide guidance and direction on how to carry out KM in an organization". Reasons why a KM implementation framework is important include the following:

- To improve the awareness and understanding of the KM domain.
- To provide a more holistic view of KM.
- To facilitate the communication of KM across an organization.
- To determine the scope of KM project and initiatives.
- As an assessment tool.
- To facilitate the management of the implementation process.

3.2.5.1 The knowledge life cycle framework

The generic task patterns or phases of any decision/execution cycle are planning, acting (including deciding), monitoring, and evaluating² (Firestone and McElroy, 2003a, p.34).

- Planning means setting goals, objectives, and priorities, performing cost/benefit assessment as part of prospective analysis and revising or reengineering a business process. Firestone and McElroy (2003) see it as a knowledge production and knowledge integration activity inclusive of capturing and using data, information and knowledge.

¹ The word 'community' has old roots, going back to the Indo-European base *mei*, meaning 'change' or 'exchange'. Apparently this joined with another root, *kom*, meaning 'with', to produce an Indo-European word *kommein*: shared by all.

² Quite similar to the Plan-Do-Check-Act (PDCA) cycle of quality management by Demming.

- Acting means performing the specific domain business process. Firestone and McElroy (2003) see it as involving planning knowledge but not producing new knowledge.
- Monitoring means retrospectively tracking and describing activities and their outcomes. Monitoring involves gathering data and information, modeling processes, and using previous knowledge to produce new descriptive, impact related, and predictive knowledge about the results of acting.
- Evaluating means using the results of monitoring along with previous knowledge to assess the results of acting and to produce knowledge about the descriptive gaps between business outcomes and tactical objectives and about the normative (benefits and costs) impact of business outcomes.

The Knowledge Life Cycle (KLC), in an organizational context, is a description of instrumental behaviour and motivation which, rather than being aimed at achieving an operational or business outcome goal-state, is focused instead on reaching a certain epistemic or knowledge outcome goal-state¹ (Firestone and McElroy, 2003a, p.48).

3.3 KM implementation

3.3.1 The importance of knowledge management

Scholars and observers from disciplines as disparate as sociology, economics, and management science agree that a transformation has occurred – 'knowledge' is at the center stage (Davenport et al., 1998, cited in Martensson, 2000). This development has forced steep learning curves as organizations struggle to adapt quickly, respond faster, and proactively shape their industries (Allee, 1996, cited in Martensson, 2000). A quick tour of the ABI/INFORM database reveals that the number of new KM articles has, on the average, more than doubled each year over the past decade. This is some measure of the importance of the subject probably due to sayings as "with rare exceptions, the productivity of a modern corporation or nation lies more in its intellectual and systems capabilities than in its hard assets..." (Quinn et al., 1996, cited in Despres and Chauvel, 1999).

In a recent survey reported by the CIO Insight (450 Chief Information Officers from industries as education, financial services, government, healthcare, manufacturing, retail/wholesale), KM ranked 7th on a list of 21 critical technologies and was expected by 68% of them to improve by 2010 to the point where it would deliver a clear return on investment.

Surveys about the importance of knowledge management to business reported the following results (Chase, 1997a):

- Importance of knowledge as extremely/very critical to organizational success ranked as relevant to:
 - Customers – 93%
 - Competencies – 84%
 - Best practices – 82%
 - Products/Services – 81%

¹ Not to be confused with the concept of knowledge life cycle at IAI (presented in section 4.4.1).

- Competition – 68%
- Expected improvement to organization due to improved knowledge management:
 - Improved decision making – 89%
 - Increased responsiveness to customers – 84%
 - Improved efficiency¹ of people and operations – 82%
 - Improved innovation – 73%
 - Improved products/services – 73%
- KM organization (widely recognized as necessary to have groups and individuals with the responsibility for encouraging and supporting KM):
 - KM responsibility with centralized function – 36%
 - Central function supporting local organizations – 40%
- In most cases KM was approached as a series of separate, often unconnected initiatives, rather than from the approach of a holistic business strategy. Type of KM exercised:
 - Customer-focused knowledge – 71%
 - Transfer of knowledge and best practices – 60%
 - Personal responsibility for knowledge – 43%
 - Innovation and knowledge creation – 43%
 - KM as a business strategy – 27%
 - Intellectual asset management – 26%
 - Performing all of the above – 3%

A survey of European firms by KPMG (1998) found that almost half of the companies reported having suffered a significant setback from losing key staff with 43% experiencing impaired client or supplier relations and 13% facing a loss of income because of the departure of a single employee (Alavi and Leidner, 2001).

3.3.2 KM links to business strategy

Strategy has been defined as "a careful plan or method; the art of devising or employing plans or stratagems toward a goal" (The Merriam Webster dictionary). The enterprise strategy is the road map of how to get to the desired destination, while the vision is to determine if the destination is correct. David Skyrme (2002) claims that "knowledge management has flirted with becoming a fad but in fact, has moved beyond fad to take its place as part of the ongoing business improvement evolution" (Skyrme, 2002).

It has already been shown that the key components of successful knowledge management are strategy, culture, technology, organization and people. Knowledge management has very diverse allied fields as organizational learning popularised by Peter Senge in 'The Fifth Discipline' (Senge, 1990), innovation leading to R&D (Suh, Sohn, and Kwak, 2004a; Lettice and Young, 2002), new product development² (NPD) (Roth, N. G., 2002), processes (Amaravadi and Lee, 2005; Remus and Schub, 2003), and even complexity

¹ Efficiency is calculated solely on input variables. Its measures show how well an organization is using its capacity regardless of what it produces (Sveiby, 1997p.154).

² In IAI the term is 'new product initiative' (NPI) to account for cases where the new product is a service or a maintenance capability, while development is associated with design.

theory (McElroy, 2000). Building a knowledge dimension into the use of strategy tools is a first step towards developing and implementing a knowledge-based strategy. A wide variety of strategy tools are compatible to knowledge management (Drew, 1999):

- Vision or mission statements – a meaningful focus on knowledge can be introduced into such a statement.
- Objectives and targets – various tools are available as the balanced scorecard or the PDM; all adequate for both strategic planning and knowledge management.
- Competitive intelligence, industry analysis, and environmental scanning - used to assess threats and opportunities in the external environment. A knowledge map about key competitors is the KM contribution that includes 'yellow pages'.
- A 'SWOT' analysis, - a knowledge map which would include the 'know-how' of innovation and process capabilities; the 'know-what' of professional expertise; the 'know-why' of business dynamics; and the 'know-who' of important personnel.
- An audit – applicable for knowledge as well as a systematic comparison between the existing knowledge map and what is perceived as what it should be.
- Product life-cycle and business portfolio matrices – and comparatively a portfolio of knowledge representing:
 - 'What we know we know' (in use for sharing programmes).
 - 'What we know we don't know' (target of intelligence gathering and market research purposes).
 - 'What we don't know we know' (unidentified tacit knowledge).
 - 'What we don't know we don't know' (unidentified gaps in the knowledge required for proper operation).

It has been suggested by Skyrme that the integration of knowledge management process into the business management process and strategic thinking has significant benefits (Skyrme, 2002, cited in Petrash, 2002). He saw the knowledge contribution to strategy divided into two 'thrusters':

- Making knowledge that is already known easily accessible.
- Innovation; the creation of new knowledge that has value.

This approach also reflects from the argument saying that for effective knowledge management, it is critical to find the balance between structure (systematisation and organization) and chaos (creativity and innovation) (Lloyd, 1996, p.577).

The Gartner Group has published a white paper in the Serviceware serie (Charney and Jordan, 2000) specifying the strategic benefits of knowledge management for the customer service organizations in a very pragmatic way:

- Growth in online customer base.
- Customers' high expectations requiring adequate information.
- Cost and complexity of required knowledge base (in proportion to the sophistication of the customer base).
- Challenges in maintaining the quality of service in spite of the dramatic change in customer base due to the Internet access.

- Sharing expertise between service agents in an effective way.
- Maintaining the knowledge base in spite of the high turnover rate.

Organizations applying a KM strategy, recognize knowledge as an their most valuable and under-used resource and places the intellectual capital at the centre of what the organization does (Ash, 1998, cited in Martensson, 2000, p.210). To start creating a KM strategy, the recommendation for the organization is to build systems for capturing and transferring internal knowledge and best practices (Allerton, 1998, cited in Martensson, 2000, p.210).

3.3.3 KM contribution to performance

Some work has been done relating KM to performance management. To mention a few, as a framework for levels of technological knowledge; a set of metrics for measuring and forecasting knowledge work, describing the thinking involved in developing software as knowledge work; a framework in which companies can measure their current situation with respect with intellectual capacity and related management structure (del-Rey-Chamorro, Roy R. (Rajkumar), van Wegen, and Steele, 2003). A framework to align macro KM (where *how* the business will achieve the KM targets is determined), to micro KM (*what* to target in KM activities), was developed (Chandler, 1999, cited in del-Rey-Chamorro et al, 2003, p.48). The purpose of the framework is to allow organizations to determine what factors at the operational level should be measured to fulfil the strategic objectives of the business.

Other frameworks show how to develop performance indicators for KM solution (Roy et al., 2000, cited in del-Rey-Chamorro et al, 2003). A gap was recognized between the contributions of KM activities and the business objectives, and this was the subject of their research. The result is a framework divided into three stages, the strategic level (macro) representing the business, the operational level (micro) representing the KM activities, and the bridge between them. This research provides a structured way to develop key process indicators (KPI) for KM solutions to enable measuring their effectiveness¹.

The contribution of organizational knowledge for the creation of value in an organization was shown to express itself in four ways (Hamel, 1996 cited in Carrion, Gonzalez, and Leal, 2004):

- Applying new knowledge to old products.
- Developing new products and services.
- Creating value by globalizing deeply embedded local knowledge.
- Converting knowledge to strategic knowledge to create shareholder wealth.

Holsapple and Jones investigated the activities related to knowledge management and their impact on competitiveness (Holsapple and Jones, 2004a). A consolidated list² of 61 distinct activities divided into nine classes was established (appendix 1). The *top line finding* (as put by the authors) is that

¹ Effectiveness is calculated with both input and output variables. Its measures show how well an organization is satisfying the needs of those it serves (Sveiby, 1997p.154).

² This list has been used in the making of the questionnaire for this research (section 5.5.1.2), and was also an important contributor to the potential success factors (section 3.4).

each of the 61 types of KM activities is capable of being performed in ways that have a substantial positive impact on an organization's competitiveness.

3.3.3.1 KM as process knowledge

Knowledge management has been compared to quality management in asking the question from an operational perspective on "how can a knowledge perspective (as compared to a quality perspective) lead to improvement in performance?" Most researchers undeniably state that though there are many similarities (Dvir, 2002), knowledge is not using the same hard measure of success¹ as quality is (Armistead, 1999). KM hasn't yet established any international standard as the USA Malcolm Baldrige Quality Award model (Malcolm Baldrige National Quality Award (MBNQA), 2001), or the European Foundation of Quality Management Business Excellence Model (European Foundation for Quality Management (EFQM),). Nevertheless, the literature suggests more and more an operational advantage to firms managing their knowledge. Focusing at a strategic level on the notion of core competences, would for instance give the firm sustained advantage over its competitors through their use in processes (Nonaka and Takeuchi, 1995, cited in (Armistead, 1999)).

The KM literature has tended to focus on identifying employee knowledge, particularly their tacit knowledge, on the grounds that this is where the useful knowledge resides. While this viewpoint is perfectly valid and useful, process knowledge, which in part overlaps with employee knowledge, is also an essential part of organizational knowledge and has tremendous significance from a knowledge management perspective (see table 3-2).

Knowledge domain	Personnel knowledge	Process knowledge
Type of knowledge	Mostly tacit	Mostly explicit
Degree of formality	Informal: based on employee experience	Formal: based on organizational experience
Method of generation	Interviewing, discussion groups, etc.	Process management: observe, analyse, design, implement
Extent of codification	Not to a great extent	Explicit part, provided context is preserved

Table 3-2: Differences between personnel and process knowledge

"A crude definition of a process is a grouping of related activities" (Garvin, 1997, cited in Amaravadi and Lee, 2005). According to Davenport *et al.* (1996), a process is an ordering of activities across time and place, with a beginning, an end and clearly identified inputs and outputs: a structure for action. Knowledge, according to (Davenport and Prusak, 1998), is "a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information". Knowledge thus, is contextual and includes an actionable summary and interpretation of experience. Process knowledge as well is contextual,

¹ See also section 5.2 for a contextual approach to success.

experiential, value laden and insightful information about a process, including how it is configured, how it is coordinated, how it is executed, what outputs are desirable and what impacts it has on the organization.

Amaravadi and Lee (2005) have further defined seven dimensions to process knowledge. These will be more or less relevant depending on the type of process, its being well defined, critical, involving coordination and having well defined outputs. The dimensions are:

- Structural – this dimension is concerned with configurations of a process, particularly the orderings of activities which characterize organizational processes (Malone et al., 1999, cited in Amaravadi and Lee, 2005).
- Personnel and coordination – this dimension refers to the training and management that are necessary for the process to achieve its desired result, particularly when it involves multiple employees.
- Performance and tools – this dimension is concerned with the knowledge associated with the execution of the process and the tools used.
- Discourse – this dimension refers to the meandering process of arriving at decisions (Hewitt, 1986, cited in Amaravadi and Lee, 2005).
- Results – this dimension concerns two types of knowledge: the outcomes of a process being executed, and results concerning its effectiveness.
- Quality and objectives – this dimension is concerned with the quality of the process and its outcome as well as with the requirements to be met by administrative and managerial processes.
- Impacts and implications – this dimension is concerned with implications for organizational action and includes both the implications related to the results and those related to their effectiveness.

A blueprint for the implementation of process-oriented knowledge management has been introduced (Remus and Schub, 2003). The process-oriented view offers a number of advantages for KM, such as orienting KM towards the value chain and applying widely accepted management methods (Maier, 2002, cited in Remus and Schub, 2003). A process-oriented knowledge structure should provide the process context by classifying and structuring process knowledge – knowledge about, within, and from processes, according to the specific needs of certain activities in business process (Eppler et al., 1999, cited in Remus and Schub, 2003). This structure links process elements, as roles, tasks, information or business objects or process outputs, to various knowledge elements. These can be linked to documents concerned with project description, with lessons learned, or with task instructions. The blueprint consists of two models – a procedure model and a conceptual model. The procedure model describes the main steps that are necessary to implement a process-oriented KM for different business processes. Based on the conceptual model where all KM activities are described to set up and support the knowledge life cycle, the procedure model is used to customize these KM activities to fulfill the specific requirements of concrete business processes.

3.3.3.2 Contribution to R&D

The competitive environment of high technologies industries are typically associated with rapid change and substantial uncertainty, and demand

continuous improvement in R&D capability. The knowledge intensive nature of R&D led many scholars to emphasize knowledge management as an important means of R&D innovation (Parikh, 2001 cited in Suh et al, 2004a, p.5; Thomond, Lettice, and Herzberg, 2004). Others have also found a positive effect on new product development (NPD) performance for companies that strongly implement knowledge management methods (Liu, Chen, and Tsai, 2004). (Roth, N. G., 2002) argues that performance measurement of knowledge is emerging as a possible mechanism to support improvement in highly complex NPD environments. The ultimate purpose of KM at R&D organizations is to facilitate new product development through knowledge creation. As such, it is essential for KM in R&D organizations to address effective knowledge flow among individual researchers, as well as knowledge collaboration across organizational boundaries with customers and/or partners. The model developed by Suh, Sohn, et al. (2004), illustrates core KM elements in R&D organizations, and relates them to the various factors¹ and enablers identified in the literature. Those are among others, the KM performance and strategy, the organizational infrastructure, the culture that encourages members of the organization to create and share knowledge (for this factor see also (Brentani and Kleinschmidt, 2004)), and the existence of supporting organizations as communities of practice. The characteristic of value and goal for R&D organizations is the creation focus for future business. This would be matched with the ultimate purpose of KM being to facilitate new product development through knowledge creation. The characteristic of R&D tasks is project oriented, it is uncertain and open. Open knowledge creation would then serve best the task performance and R&D KM must focus on effective knowledge flow in project based tasks. Finally, the characteristic of R&D people is of highly educated and talented human resources. These usually put high value on knowledge assets and they have a strong interest in self development. As such R&D KM must also support basic theory development shared between the various communities of practice. The model developed at Samsung Advanced Institute of Technology included KM measurement metrics, a template based management system, various informal groups as communities of practice, and a set of rules and motivational structure to address researchers' individual aspiration for self development (Suh, Sohn, and Kwak, 2004b).

Design, according to (Hicks, Culley, Allen, and Mullineux, 2002), can be considered to be an information transformation process. The process of transformation from one design or information state to another is the result of a decision process, driven by knowledge and information. The application of knowledge and information is necessary because explicit, limited information is not a sufficient basis for decision making. In engineering design this additional knowledge will typically infer a measure of some quantity or quality between options. In addition to this, there is a creative aspect to the transformation process. There are two types of creative activity; *adaptive* and *inventive*. Adaptive creativity involves the adaptation and extension of existing knowledge to a new situation, whilst inventive creativity is purely original. (Court, 1995 cited in Hicks et al, 2002, p.267) conclude that knowledge is the ability of the

¹ To be compared with the list of factors generated in chapter 6.

individual to understand information. This corresponds to work in the management sector, which defines knowledge as information within people's minds (Davenport & Marchand, 1999 cited in Hicks et al, 2002, p.267). However, it is not the knowledge itself which is a within-person capacity but the generation of knowledge. Hicks, Culley et al, propose two aspects to knowledge production; knowledge processes and knowledge elements. Knowledge elements are produced by knowledge processes, which are generated by an individual through the understanding, assimilation and application of information¹.

3.3.3.3 Contribution to management

Looking at KM as a management tool, Martensson (2000) has identified the following taxonomy of knowledge:

- "Knowledge is something that resides in people's minds rather than in computers, and so it cannot easily be stored" (Gopal and Gagnon, 1995, cited in Martensson, 2000, p.208).
- "Information has little value and will not become knowledge until it is processed by the human mind" (Ash, 1998, cited in Martensson, 2000, p.208).
- "Knowledge involves the processing, creation, or use of information in the mind of the individual" (Kirchner, 1997, cited in Martensson, 2000, p.208).
- "Knowledge should be studied in context. Knowledge is information combined with experience, context, interpretation, reflection, and perspective" (Davenport et al., 1998, cited in Martensson, 2000, p.208)
- "Knowledge becomes meaningful when it is seen in the larger context of our culture, which evolves out of our beliefs and philosophy" (Allee, 1997, cited in Martensson, 2000, p.209).
- "Knowledge is ineffectual if it is not used. Knowledge is a high-value form of information that is ready to be applied to decisions and actions" (Davenport et al., 1998, cited in Martensson, 2000, p.209).
- "Knowledge is the capacity to act on information and thereby make it valuable" (Sveiby, 1997, cited in Martensson, 2000, p.209).

In an article highlighting knowledge management as a part of project management (Koskinen, 2004), the author differentiates between four different project management environments according to the knowledge gap that exists between the existing knowledge base of the project team and the required knowledge base for the project successful performance. He then appropriates different types of knowledge management to each of them, and concludes that the knowledge of the project is the shared knowledge of project team members. Hubert Saint-Onge (then of Clarica and interviewed by (Chatzkel, 2000)), speaks about a new employment contract he foresees, that would be based on individuals bringing forward their commitment to create value in exchange for being given the opportunity to develop their capabilities. He claims there is no knowledge strategy possible without that shift to self-initiative, but adds that the shift from a narrow self-centred perspective to interdependence and the ability

¹ See additional description of these two types in section 3.3.3.2.

to partner is the other dimension of the cultural change required for knowledge. He concludes with the identification of three values for the members of the organization¹:

- Stewardship – about utilizing their resources and those of their customers and leveraging those resources to the best extent possible.
- Partnering – working internally in teams, working with customers as partners, and working with business partners through mutual respect.
- Innovation – a composite of knowledge, learning and innovation.

3.3.3.4 Benchmarks

Knowledge management presents significant organizational and technical challenges as it requires the integration of an effective knowledge network with a wide range of technological opportunities. A major European conference concerned with the measurement, management and leverage of knowledge, gathered a few years ago leading figures in the industry involved with knowledge management (Lloyd, 1996):

- Gordon Petrash represented the Dow Chemical Company and reported on how the firm used the effective accumulation and use of intellectual capital to improve their capacity to add value to the business. It reflected in their vision: "Maximize the business value of Dow's intellectual assets"; and established a concept of a knowledge value chain, beginning with ideas, know-how, skills, competences and other forms of intellectual capital, that can be transformed into intellectual assets with a measurable value to the business, particularly through the more effective use of patents and partnerships.
- Charles Savage of Digital Equipment Corporation claimed that the key to achieving and maintaining sustainable competitive advantage now needs to be embedded in a culture of valuing and trust enabling individuals, and companies to "break open their treasure chests of knowledge" (Savage, 1990).
- Dr. Josef Hofer-Alfeis of Siemens presented how best to approach a new knowledge management initiative, and how to provide practical strategies in methodological mapping of the knowledge core competencies in the context of business process or enterprise models. The focus was on the active development of knowledge through R&D and improved learning processes. The point was made that it was essential to achieve a balance between the pressures to organize and systematize through structure, and the need for the chaos that came with, and encouraged, creativity and innovation.
- Larry Prusak of Ernst & Young looked at the subject from the perspective of its strategic significance, the critical area of the implications for working practices, roles and responsibilities, as well as the resources likely to be required for integrating the practice into a company's culture.
- Patricia Seemaa, of Hoffmann LaRoche managed to reduce time to market by leveraging and applying knowledge.

¹ Not to be confused with the values of the organization.

- Bipin Junnarkar of Monsanto advocated radical decentralization, coupled with advanced information technology to be the key to competing in fast-changing markets.
- Hubert Saint-Onge of CIBC, claimed that stimulating learning is not enough; individual expertise and learning must be transformed into explicit corporate knowledge which can be leveraged to maximum effect.
- Leif Edvinsson of Skandia argued that human, structural and customer capital can be measured and that these intangible knowledge assets affect the bottom line and strategic corporate development.
- British Petroleum has established its virtual teamwork which is a holistic approach integrating three key performance drivers: people, process and technology, to achieve instantaneous communication, and help people work and share ideas with people anywhere and anytime. In addition, they have established a 'yellow pages' directory to help employees identify who in the organization knows what and a computer-based initiative to track employee information requests (Chase, 1997b).
- Glaxo Wellcome's goal is "building a learning organization by leveraging knowledge". They too, have established a network supported by the company's Intranet, which identifies who's who and what are their key activities. It includes discussion groups and provides development opportunities and access to coaching support (ibid).
- Zeneca Pharmaceuticals is developing strategies to minimize the loss of knowledge through staff turnover, shorter product life-cycles and inadequate communication by developing a KM vision and communicating it through the organization, maintain standards and best practices and management of business wide information (ibid).
- Mel Goodes, former CEO of Warner-Lambert pharmaceuticals who has practically led the KM effort there says that "any returns we earned in Warner-Lambert ultimately reflected how well we managed the knowledge of our research teams" (Goodes, Sample issue). The strategy included bursting-up the silo-oriented thinking to operate at an enterprise level, leveraging assets, keeping and growing the leaders of the future, and measuring every initiative against how it moved them with the customers they served. They integrated their fragmented global supply chain which originally included inefficient processes causing them to waste money in an area that was not a competitive differentiator. They defined knowledge management as "the systematic acquisition, synthesis, sharing, and use of insight, knowledge and experience to enable ongoing improvement for competitive advantage".
- At Motorola, the KM programme framework, focused on the new product introduction process. The NPI process includes the design, product introduction, and manufacturing of new products, and is part of an 'M-gates framework' (Cooper, 1993, cited in Herder, Veeneman, Buitenhuis, and Schaller, 2003 ,p.105). This framework is based upon 'process gate stages' that consists of 15 gates, starting at market and product line planning (gate 15), and ending at end of life (gate 0) of a product. Fast and high quality production is one of the key goals in this NPI process. It is therefore, in these processes that Motorola has to leverage its

intellectual capital to faster develop and produce better products than their competitors.

3.3.4 KM processes

In essence, KM is the examination of mechanisms that facilitate critical organizational processes, the measurement of their performance and the development of practical solutions that deliver one or more KM objectives (Levett and Guenov, 2000). The business community has articulated the following core KM objectives through an analysis described in KPMG (1999) as:

- Supporting innovation, the generation of new ideas and the exploitation of the organization's thinking power;
- Capturing insight and experience to make them available and usable when, where and by whom required;
- Making it easy to find and reuse sources of know-how and expertise, whether they are recorded in a physical form or held in someone's mind;
- Fostering collaboration, knowledge sharing, continual learning and improvement;
- Improving the quality of decision making and other intelligent tasks;
- Understanding the value and contribution of intellectual assets and increasing their worth, effectiveness and exploitation.

The author has chosen to concentrate in this thesis on the following processes:

3.3.4.1 Capturing and reusing knowledge

"Data, information and some elements of knowledge can be captured. However, the purpose or intended use of the captured materials will significantly affect the level and extent of material that is necessary in order to acquire truly useful information or knowledge, and describe the limit of its applicability" (Hicks et al, 2002). Data is usually considered to be textual, either numeric or alphabetical, but in any case – structured or ordered. Information is usually described with respect to data. Information elements are describing facts by providing meaning and an appropriate measure, or accordingly, a subject or a descriptor, and a predicate or value. Two classes of information are considered, formal (textual - structured, pictorial – structured, or verbal - explanative), and informal (textual - unstructured, pictorial – unstructured, verbal - conversational, memory and expression). As mentioned in section 3.3.3.2, there are two aspects to knowledge production; knowledge processes and knowledge elements. The knowledge process is the procedure utilised by the individual to infer the knowledge element from information. These knowledge processes are generally within-person processes, which complicate the ability to formalize many of them. In contrast to this, knowledge elements that are in fact conveyed as information can easily be represented. This information can be formal or informal. Because of the nature of informal information and the inherent differences between within-person processes, the knowledge generated by various individuals from the same element of informal information may very well be different. In case of engineering science, these processes can be considered to be scientific practices or procedures.

For the most part, data is rarely captured in isolation, and it is usually a subset of information, where a context or descriptor applies to individual data elements. Capturing generally results in an electronic format, enabled by keyboards, microphones, scanners, or cameras; and stored in an ordered way in repositories. Informal information may also be stored in electronic format, but for it to be reusable, additional information must be added to it to 'formalize' it. Knowledge elements are typically conveyed as formal or informal information, thus inferred knowledge may be captured and represented in the same manner as information.

Hicks, Culley, et al. (2002) have considered four generic classes of reuse:

- Decision making encompassing the decision outcome, the alternatives and the basis of the decision process.
- Descriptive elements describing objects, events, or processes.
- Measurements representing the value of objects, events, or processes.
- Distribution that could include elements from any of the above categories, but specifically processed for exchange between individuals, environments, or processes.

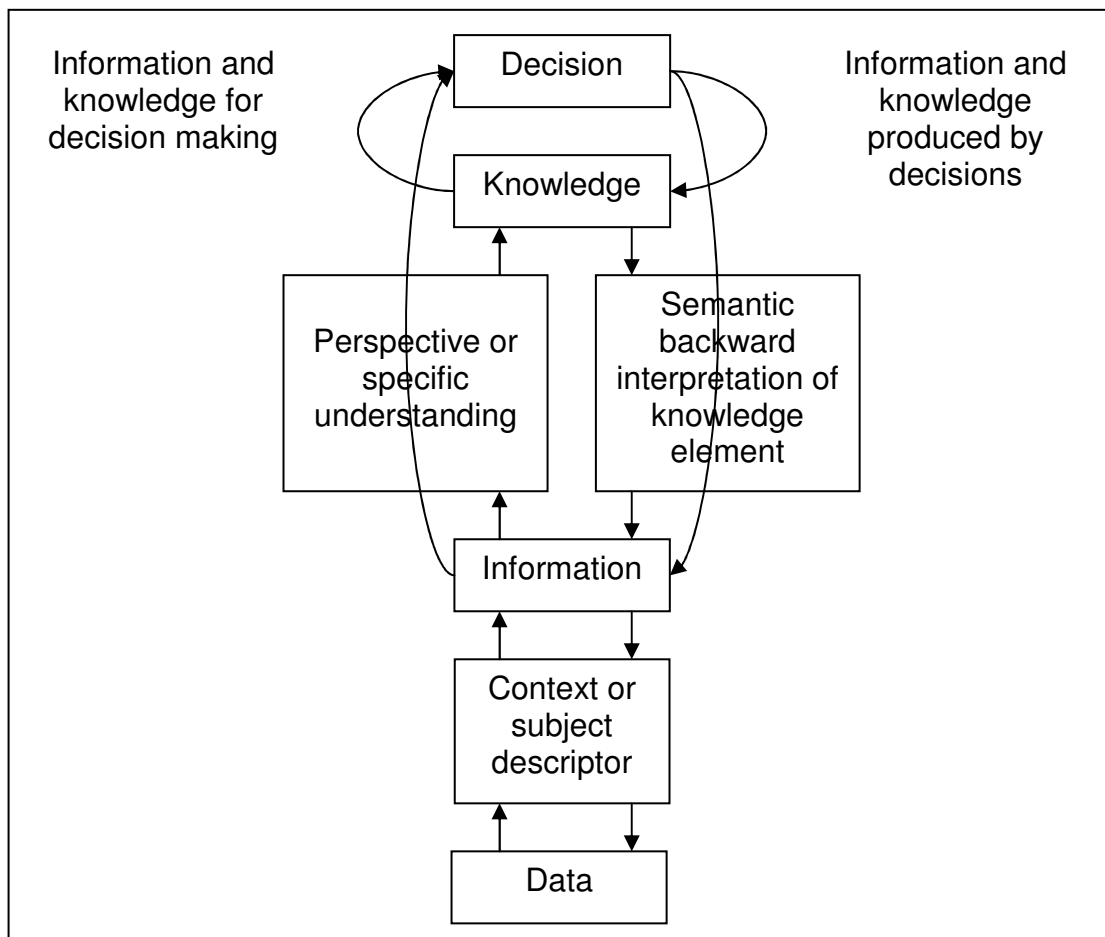


Figure 3-1: Bi-directional information and knowledge transformation process for decision making (Hicks et al, 2002)

For the utilization of information and knowledge for engineering design there will always be a requirement for designer intervention and intuition, not least for the

creative aspect of the process, but also for the assimilation and application of the vast amounts of knowledge. This calls for a bi-directional inference, and there will always be the need for continuous conversion of knowledge into information, and vice-versa as shown in figure 3-1.

Referring to capturing knowledge from people's brain, a different school of thoughts asserts that knowledge cannot exist outside of the human brain, and that any expression of the knowledge requires it to be transformed into information to be communicated outside of the brain. By this approach, information is acquired through the sensors to the brain where it is processed with prior knowledge and new knowledge can be created from the processing of information within the brain only (Beveren, 2002).

3.3.4.2 Competence centres

More and more organizations are investing in the identification and management of their key resource capabilities (critical knowledge areas sometimes called, competence centres), recognizing how instrumental they are in the provision of sustainable competitive advantage to the organization. For organizational knowledge to provide a sustainable competitive advantage it must be valuable, rare, imperfectly imitable, and imperfectly substitutable. Organizational knowledge can provide a sustainable competitive advantage in facilitating value creation by applying new knowledge to old products; by developing new product and services; by globalizing deeply embedded knowledge; and by increasing added market value (Hamel, 1996 cited in Carrion et al, 2004). Moreover, organizational knowledge can facilitate the development of differential capability as process, cultural, positional, and regulatory.

The outcome of a research on the subject, conducted by Carrion, Gonzalez, et al. (2004) (Carrion et al, 2004) was that critical knowledge areas enhance the sustainability of competitive advantage, and improve the organization reputation and its competitive position (differentiation strategy). It was proposed to incorporate the information on the identity and measures of the critical knowledge areas in future management decision-making, and to perform periodic testing of the critical knowledge areas and measures.

3.3.4.3 Communities of practice

The term community of practice (CoP) describes an activity system that includes individuals who are united in action and in the meaning that action has for them and for the larger collective. They are informal entities, glued together by the connections the members have with each other, and by their specific shared problems or areas of interest. The latest reports from the field suggest that virtual communities of practice are becoming a KM tool choice for an increasing number of multinational corporations. Among the chief reasons why communities of practice are efficient tools for knowledge generation and sharing is the fact that most of a firm's competitive advantage is embedded in the intangible, tacit knowledge of its people, and because competencies do not exist apart from the people who develop them. The successful functioning of a knowledge-sharing community of practice is impossible without an active participation of a substantial part of its members. The method overcomes

barriers to sharing information, such that if people would be reluctant to write something for the data-base, they might find it easier to talk about it with their colleagues to the community. Reasons for sharing, range from self-esteem boosting to altruistic and conformist consideration (McLure and Faraj, 2000 cited in Ardichvili, Page, and Wentling, 2003 p.66). Posting of knowledge entries by some member of a community must be matched with active participation by other members visiting the CoP web site, when they are looking for advice of information.

Ardichvili, Page, et al. (2003), conducted their research at Caterpillar Inc. which started their CoP activity in the mid 90s and called it 'communities of knowledge sharing'. Their first CoP was established in 1997 and at the time of the research they already had 600 online communities with more than 15000 members worldwide. The result of the study, grouped according to the four research questions shows (Ardichvili et al, 2003):

- *What are the reasons for employees' willingness to contribute their knowledge to virtual knowledge-sharing communities of practice?*
 - The majority of respondents view their knowledge as a public good.
 - Knowledge exchange is motivated by moral obligation to the organization as a whole, and to their professional community of engineers.
 - The willingness to share is part of the organization's culture.
 - Employees felt the need to establish themselves as experts.
 - Several managers and experts felt that they had reached a stage in their lives when it was time to start giving back, sharing their expertise, mentoring new employees.
- *What are the barriers to employees' contributing their knowledge to virtual knowledge-sharing communities?*
 - The research points to the absence of a major barrier to knowledge sharing, often cited in the literature, and variously defined as "information hoarding", or as "knowledge as an individual's private asset and competitive advantage" mentality (Watson, 1997 cited in Ardichvili et al, 2003 p.988). Thus, the majority of participants (55 percent) believed that there was a strong evidence of employees' willingness to share, and only a small minority (less than 10 percent) believed that some employees are not willing to share because of the "information hoarding" reasons.
 - People are afraid that what they post may not be important or may not be completely accurate, or may not be relevant to a specific discussion.
 - Need for more clear directions for distinguishing between acceptable and not acceptable postings.
 - New employees often feel intimidated about posting because they do not believe they have 'earned the right' to post on a company-wide system.
 - The process of getting knowledge entries approved by managers is time consuming.
 - Security and confidentiality considerations lead to self-imposed censorship.

- *What are the reasons for employees' willingness to use virtual knowledge-sharing communities of practice as a source of new knowledge?*
 - The majority of respondents view the system as a kind of encyclopedia.
 - The system is a useful problem-solving tool.
 - The system is used to obtain help with specific problems from individual experts.
 - The system is viewed as a tool for keeping informed of general developments in their profession.
 - The system is viewed as a tool for managing the work.
 - The system is a useful tool that can replace or complement some of the meetings.
 - The system helps new people to more quickly integrate themselves into their new place of work and become productive faster.
 - The system is viewed as a place to work together, to access to 'best practices' or to 'lessons learned' data-bases, and as an easy link not only to one's own community, but to other related communities and topics.
 - The system's ability to provide benefits beyond specific solutions to immediate problems.
 - The system provides a space for jointly generating new knowledge, not just capturing the existing knowledge.
- *What are the barriers preventing employees from using virtual knowledge-sharing communities as a source of new knowledge?*
 - Face-to-face group makes the knowledge network connecting the virtual CoPs redundant¹.
 - Some process-oriented problems are hard to duplicate thus making finding a solution on the knowledge network difficult.
 - In some cases, people need a quick and accurate solution, and with the system there is a danger of getting lots of answers, some of which may not be accurate and require additional time for verification.

(Martins, Gilson, and Maynard, 2004) have investigated the virtual aspect of communities of practice which they call virtual teams (VTs). Their research shows the main differences between VTs and CoPs. The *locational* boundary refers to any physical dispersion of team members, such as different geographic locations or different workplaces at the same geographic location. The *temporal* boundary encompasses lifecycle and synchronicity. Lifecycle captures the extent to which a team is temporary or ongoing, while synchronicity refers to the timing of member interaction on the group's task. The *relational* boundary refers to the differences in relational networks of VT members, that is, their affiliations with other teams, departments, organizations, and cultural sub-groups. In general, individuals are more likely to look within their relational networks rather than across networks for team members. However, VTs can overlap multiple relational networks, enabling teams to be

¹ The authors are considering CoPs exclusively as virtual teams, and therefore this remark. The researcher objects to this limitation and at IAI, CoPs are required to physically meet on a monthly basis, beyond their usage of the IAI-Net as a means of communication.

composed of members based on 'what they know' rather than 'who they know'. In such teams, members have to work across differences in assumptions, motivations, knowledge bases, and working styles that characterize each of the relational networks that are spanned by the team:

- Team inputs comparison (input variables represent the design and compositional characteristics of a team):
 - VTs as opposed to CoPs that meet physically are often conceptualized as having a more fluid membership such that a specific expertise can be added or removed as tasks change.
 - Researchers have noted the tendency of VTs to possess a shorter lifecycle as compared to face-to-face teams.
 - Group size has traditionally been described as critical to group performance. Researchers have noted that team size may affect VTs differently than face-to-face teams because technology can mitigate the negative effects of size. On the other hand, the number of ideas generated in VTs has been found to increase with group size, which contrasts with results found in face-to-face groups.
 - A proposed benefit of VTs is that they can bring together individuals with the needed knowledge, skills and abilities regardless of their location. It has been found that technical expertise in a VT is positively related to a team's success, the team's ability to deal with technical uncertainty, and group member trust.
 - The diminished non-verbal and visual cues associated with increased technology usage have been cited as reasons why VTs take longer to make decisions, are less able to make inferences about members' knowledge, and are less able to anticipate other members' responses.
 - Theorists initially argued that group composition would be less salient within VTs and empirical research has indeed found that status effects are reduced in virtual interactions. Some researchers reported that minority members were more likely to express their opinions in anonymous conditions, but their opinions were given more consideration in the face-to-face condition.
- Team processes comparison ("how" teams achieve their outcomes):
 - It has been argued that developing a shared vision or mission may be more difficult for VTs, as it is often harder for members to establish a unified sense of purpose due to diminished member interactions.
 - A study assessing variability in the project management of 103 global, virtual, and collocated new product development (NPD) teams found that collocated teams reported a significantly lower number of difficulties with various aspects of project management (such as keeping on schedule and staying on budget) than did virtual or global teams.
 - A reason proposed by those who have found that VTs experience increased participation is that computer-mediated communication allows for asynchronous communication that encourages members to contribute based upon their own schedules.

- It has been noted that since the communication tools used for virtual interaction allow for records to be retained, VTs have a means for monitoring team activities that are not available to face-to-face teams.
- Interpersonal processes comparison (such as conflict, uninhibited behavior, interpersonal trust, and group cohesiveness):
 - In comparing face-to-face groups to VTs, some researchers have found that conflict is more likely to occur in virtual contexts (researchers have long stated that conflict is an important process that allows teams to make better decisions because more alternatives are generated and considered prior to a decision being reached).
 - Related to conflict, researchers have found that the virtual context lends itself to more uninhibited behavior by team members compared to interactions within face-to-face contexts.
 - It has been argued that trust in VTs needs to develop quickly as teams may only interact for a short period of time. Researchers have found that trust in VTs is derived initially from perceptions of ability and integrity as well as members' propensity to trust. It has also been suggested that a face-to-face meeting during the initial "courtship" period of a VT's life cycle helps develop trust in the team.
- Team outcomes comparison (affective, such as member satisfaction, and performance, such as effectiveness, speed of decisions, and decision quality):
 - In general, lower levels of satisfaction are reported in VTs than in face-to-face teams. However, for decision-making tasks, members of VT groups have reported being more satisfied with the group process, in part, because more alternatives were considered and more voting rounds took place.
 - When considering VT performance, researchers have consistently found that virtual interaction increases the amount of time required to accomplish tasks.

3.3.5 The knowledge manager task

Following on the concept of the 'knowledge chain model' mentioned in section 3.2.2.2, it has been argued that there are four major classes of managerial activities that influence and govern the conduct of the knowledge management¹ (Holsapple and Jones, 2004b):

- Measurement.
- Control.
- Coordination.
- Leadership.

The competitive impact of the various KM activities (see appendix 1), seems to occur along one or more of the following dimensions (Holsapple and Singh, 2001):

- Improving productivity.
- Enhancing agility.

¹ The author would rather put them in the following order: Leadership, coordination, measurement, control.

- Fostering innovation.
- Enhancing reputation.

It has been suggested that directors of KM initiatives need to be concerned with the knowledge chain's classes of activities, and with cultivating, harnessing, and organizing an organization's KM skills in performance of these activities.

Using a survey in more than 400 US and European organizations (Ruggles, Rudy, 1998 cited in McKeen, Staples, and Cohen, 2002), it was concluded that the typical knowledge manager is highly educated, most came from other technical or management jobs within the organization to which they have belonged for an average of eight years (first hand knowledge of the organization and the right reputation were probably instrumental for their KM task). The CKO position has been created in almost half of the case by the CEO and most of those surveyed were the first people appointed to these positions¹. Their aims were broad and ambitious: 'developing a knowledge management strategy', and 'managing and leveraging knowledge content'. With budgets that are modest if not lacking (sometimes a line item in other budgets), they were motivated 'more by a challenge than by formal power', seeking to 'make a mark within the organization' and were attracted by 'being at the forefront of something new and exciting'.

The development of the CKO function suggests a growing recognition that for many organizations, intellectual capital – the knowledge, experience, and ideas of people at every level of the firm – impacts a firm's products, services, processes, and customers. The CKO position requires a blend of technical, human, and financial skills. At a minimum, a CKO should have a clear understanding of knowledge management concepts, familiarity with knowledge-oriented organizations and technologies, and a strong appreciation for and grounding in the primary processes of the business. (Earl and Scott, 1998 cited in Jones, Herschel, and Moesel, 2003) indicate that CKOs are typically high-level appointments and that the individuals chosen for the position are usually members of senior management. The profile of 20 CKOs reveals the following characteristics:

- There is no such thing as an average CKO: they come from a wide range of professional backgrounds and organizational expectations of them differ.
- Most CKOs know the businesses and cultures of their corporations from personal experience and all of them are established figures in their organizations.
- All of the CKOs are at least somewhat knowledgeable about, and are fully comfortable with, information systems and technology (though only a few have spent most of their careers in these fields).
- Almost all CKOs are in their 40s, suggesting that significant business experience is required.
- Most CKOs have direct access to the CEO or the chief executive of a major autonomous business unit.

¹ Showing that the acceptance by corporations of the need of such a position is no more than 10 years old.

Earl and Scott (1998) have listed the following reasons for the nomination of CKOs:

- Corporate knowledge capital is neither being explicitly or effectively managed.
- Corporate resources are seen as a key to corporate growth and profitability.
- There is a realization that long-term prosperity depends upon management's ability to leverage the hidden value of corporate knowledge.
- There is a clear appreciation that people in the organization are ignoring past mistakes, making the same mistakes over and over, and wasting time that could be saved by making better use of the collective knowledge that exists in the organization.
- Having recognized the value of employee empowerment, the organization now realizes that they are not making good use of employee knowledge.

Davenport and Prusak (1998) have listed the following reasons for the nomination of CKOs (Davenport and Prusak, 1998 cited in Jones et al, 2003):

- Advocate knowledge discovery and use. They contend that given the important role for knowledge in the strategies and processes of many firms today, CKOs can champion changes in organizational cultures and individual behaviors relative to knowledge.
- Design, implement, and oversee a firm's knowledge infrastructure, including its libraries, knowledge bases, human and computer knowledge networks, research centers, and knowledge-oriented organizational structure.
- Manage relationships with external providers of information and knowledge and negotiate contracts with them. This is already a major expense for many companies, and efficient and effective management is important.
- Provide critical input to the process of knowledge creation and use around the firm and facilitate efforts to improve such processes if necessary.
- Design and implement a firm's knowledge codification process. The goal is to specify key categories of information or knowledge that the organization would address, and entails mapping both the current knowledge inventory and future knowledge models.
- Measure and manage the value of knowledge, either by conventional financial analysis or by anecdotal management.
- Manage the organization's professional knowledge managers, giving them a sense of community, establishing professional standards, and managing their careers.
- Lead the development of knowledge strategy, focusing the firm's resources on the types of knowledge it needs to manage most, and the current knowledge processes with the largest gaps between need and current capability.

The CKO has a complex responsibility that juxtaposes both technological and social skills into an important blend; he is neither a glorified information technologist nor he is a legitimized human resources executive. He is sometimes expected to be an evangelist who preaches and exemplifies the important skills required to leverage the knowledge embedded in every person and system (Bontis, 2001). As such he would have to embrace the following disciplines to be successful:

- CKO as knowledge sharing icon and therefore having a strong willingness to communicate.
- CKO as a trust steward, as this is a necessary condition for sharing.
- The CKO should work very closely with the HR department and especially the training and development staff.
- CKO as a 'techno-nerd', familiar with what technology provides for information retrieval, document management, groupware and integrated systems.
- At least from the intellectual capital point of view, the CKO must also be a number-crunching accountant. Some firms such as Skandia have even published intellectual capital addendums to their annual reports as mentioned in section 3.3.3.4.

From a survey of 307 knowledge managers out of 500 approached, Asllani and Luthans (2003) deduced that knowledge managers carry traditional management activities such as planning and coordinating, decision making, problem solving, monitoring and controlling performance as well as networking, more or less as regular managers¹ (Asllani and Luthans, 2003); interestingly, knowledge managers give much more attention to human resource activities as compared to regular managers; however, contrarily to the conventional wisdom of what they should be doing, their communications activity was lower (maybe because they made better use of IT to perform their communication more efficiently).

The CKO's main responsibility is to create and maintain appropriate conditions that enable the organization to build a customized approach to knowledge management and encourage employees to contribute to and benefit from the organization's knowledge assets. Managers looking for ways to implement their own knowledge strategy effectively may be helped by considering their firm as a market for knowledge (Webber, A. 1993 cited in Raub and von Wittich, 2004 p.715). Raub and von Wittich's (2004) survey showed that in order to achieve greater leverage, CKOs must concentrate on partnering and building internal alliances. One possible solution for the time and resource intensive implementation part of KM consists of soliciting contributions from key functional units, such as human resources and information technology. IT support is necessary for the creation or enhancement of a user-oriented information and communication platform. However, they also strongly emphasized that during the KM implementation process "the process itself and in particular people are considerably more important than technology". The CKO needs to gain firm support for KM initiatives from senior line managers who allow using line

¹ Luthans (1988) calls them real managers (Luthans, F. 1988 cited in Asllani and Luthans, 2003 p.60).

budgets for KM implementation purposes. The fact that line managers pay for projects “out of their own pocket” increases their commitment. Thereby, it contributes to focusing the project on generating tangible business value. Without a single exception, the CKOs in the study were adamant about the importance of gaining strong support from their own boss and from other top management sponsors. Top management is only periodically involved in these initiatives, primarily in order to underline the importance of KM and to demonstrate commitment and support. The CKO has to act as a role model for effective KM. The CKO should act as a consultant, a professional advisor, a service-provider and problem-solver and not to rely on top management to be the tool for implementation. An effective CKO has to be involved in two different places. On the one hand there has to be a focus on centralized initiatives, setting the boundaries for what KM is and what it is not for the organization. On the other hand, the CKO has to benefit from change leadership at the local level. This means using the natural momentum of small-scale KM initiatives that were in many cases started before the formal appointment of a CKO. One of the most significant early contributions an effective CKO can make is to create possibilities for exchange as communities of practice. Fostering CoPs is indeed one of the critical skills in early stages of KM implementation. Most respondents of the survey see the creation of communities of practice as a hallmark of successful KM implementation. CoPs lead to more effective knowledge sharing and pave the way for a knowledge-centric culture. The importance of linking existing initiatives and of fostering knowledge networks explains some of the difficulties that CKOs appointed from outside the firm often have to face. When it comes to the dominant issue of trust, CKOs who start with an inside knowledge of the organization generally get a head start. Like every major change management initiative, KM requires intensive communication. CKOs are aware that they have to deliver a compelling message in order to gain support from key organizational actors and to build effective knowledge networks. In the context of KM the content of the message is what matters. For CKOs, KM's status as a 'fashionable' management concept is a mixed blessing. While it ensures a certain visibility for their activity from the outset, it also implies a danger of negative perceptions. In a nutshell, KM may be seen as a fad without business relevance. The strategy most CKOs employ to counter this tendency is clearly to demonstrate the tangible business value of KM to a number of different target groups, while avoiding the 'hype' linked to the KM concept. One of the secrets of CKOs who are perceived as speaking the language of the client is that they manage to adapt their reasoning to different target groups. They adopt what could be called a 'stakeholder approach', i.e. depending on the particular interests of their internal partners they focus on different types of KM benefits. Targeted communication activities in the KM implementation process increase the likelihood that open and constructive dialogue will take place between the CKO and key actors in the organization. The result will be higher levels of trust and confidence at the various management levels that may be affected by and which are supposed to support KM initiatives. Based on this understanding it will be easier for the CKO to present KM as an approach that provides concrete answers to practical business concerns and thereby to position KM as a value-adding strategy. Hence, gaining support from internal

partners requires that the CKO should see the world through their eyes and should be able to meet their expectations. It means that internal partners have to be solicited as early as possible in the planning stage of KM initiatives. As a result, KM initiatives are more likely to be in line with current business strategies, to be focused on value-added processes and to yield tangible business value for the internal partner. Concluding the research with an answer to the question “what does it take to make KM implementation happen?”, Raub and von Wittich's (2004) have identified three key strategies that may provide guidance on the way:

- Successful CKOs identify and address key actors in their organizations.
- Successful CKOs actively promote the development of knowledge networks.
- Successful CKOs support their activities by delivering a purposeful message.

3.3.6 The environment

The sharing of knowledge has been the subject of numerous studies. In one of them, the environment factors promoting or impeding it have been analysed and specifically the 'organizational commitment' and the 'organizational communication' (van den Hooff and de Ridder, 2004, p.117). 'Organizational commitment' is understood to refer to the affective commitment of organizational members to their organization, whereas 'organizational communication' refers to both the communication climate¹ of the organization as a whole and the use of different instruments for communication. Organizational climate has been defined as a set of shared perceptions regarding the policies, practices, and procedures that an organization rewards, supports, and expects (James, Joyce, and Slocum, 1988; cited in Seibert, Silver, and Randolph, 2004). Dividing knowledge sharing into its constituents, namely the donation of knowledge and the collection of knowledge, it was concluded that:

- Commitment to the organization was found to be of influence on knowledge donating.
- A constructive communication climate was found to be of positive influence on knowledge donating and collecting, as well as on affective commitment (identification and involvement with the organization, a feeling of emotional attachment to that organization).
- Knowledge collecting positively influences knowledge donating (the author has identified the same in IAI's communities of practice and the original fear of losing power if donating knowledge was replaced by worry to be viewed as a 'free rider' who wasn't able to contribute as the others).

Another issue which has been the subject of studies is the one of empowerment². "At its core, the concept of empowerment involves increased

¹ Organizational climate has been defined as a set of shared perceptions regarding the policies, practices, and procedures that an organization rewards, supports, and expects.

² It is the author's belief that empowerment is **to be taken** by employees knowing what they want to achieve for the benefit of the company and willing to stick their neck out for it. Empowerment would then be gladly accorded by any management to employees like these. All this doesn't relieve management from their responsibility for the company, for its strategy and

individual motivation at work through the delegation of authority to the lowest level in an organization where a competent decision can be made" (Seibert et al, 2004). Studies have identified three organizational practices associated with empowerment:

- Information sharing.
- Autonomy through boundaries.
- Team accountability.

Seibert defines empowerment climate as a shared perception regarding the extent to which an organization makes use of structures, policies, and practices supporting employee empowerment. The overall psychological empowerment construct is composed of four cognitions:

- Meaning - the value of a work goal judged in terms of an individual's own values or standards.
- Competence – an individual's belief in his or her capability to successfully perform a given task or activity.
- Self-determination – the individual's sense of choice about activities and work methods.
- Impact – the degree to which the individual believes he or she can influence organizational outcomes.

Empowerment climate has a relatively descriptive focus, while psychological empowerment has a more subjective and evaluative focus, which is based on the match between an individual's values and the demands and opportunities of his or her work tasks¹.

It has been claimed that knowledge management programmes are rooted in a theoretical model that frames organizations as open systems. An open system's perspective assumes that organizations are highly interdependent with their environments and that they engage in system-elaborating and system-maintaining activities. It sees a close connection between the condition of the environment and the characteristics of the systems within it. From an open systems view then, organizations can be seen as existing in a dynamic, global, technology-enabled environment where information acquisition and processing are especially critical organizational activities. This model is consistent with the knowledge management concept, because firms adopting these programmes realize that their long-term well-being is dependent on their ability to detect and respond to subtle changes in their organization's task environment. (Choo, 1998 cited in Jones et al, 2003) argues that organizations use information in three vital knowledge creation activities. First, organizations use information to make sense of changes and developments in the external environments – a process called sense making². This is a vital activity wherein managers discern the most significant changes, interpret their meaning, and develop appropriate

for its future. Therefore, it is the responsibility of management (again empowered, now by their board) to lead, to decide what's best for the company and what's the best way to achieve it.

¹The author has asked the GM of the division as well as the knowledge manager, through the questionnaire if empowerment is applied and accordingly felt in the application of the KM program. The answer was generally positive. He has also asked the knowledge managers if they felt they were in position to perform their job. Here too the answer was positive though the knowledge managers remarked that they were dependent on the GMs for KM performance.

² See also Snowden's approach to the term 'sense making'.

responses. Second, organizations create, organize, and process information to generate new knowledge through organizational learning. This knowledge creation activity enables the organization to develop new capabilities, design new products and services, enhance existing offerings, and improve organizational processes. Third, organizations search for and evaluate information in order to make decisions. This information is critical since all organizational actions are initiated by decisions and all decisions are commitments to actions, the consequences of which will, in turn, lead to the creation of new information. Therefore, how well the organization adapts to its environment depends on how well it succeeds in its knowledge creation activities.

There are cases where the environment is dictated abruptly due to a merger. One of those is the European Aerospace, Defence and Space Corporation (EADS) which comprises among others of DaimlerChrysler Aerospace (a division of the fruit of another merger – the one of Daimler with Chrysler). Chrysler was known as an outstanding success story for the consistent reuse of lessons learned and best practices. Chrysler also had a tradition of using communities of practice to commonly solve problems by people doing a similar job in different areas of the company. When EADS had to establish a multinational integrating distributed engineering and design-build teams, or when it had to structure and preserve corporate knowledge to meet the loss of knowledge due to downsizing or to encounter the competitive climate in the aerospace industry, it found within itself forces with established terms, concepts and acceptance that enabled the change so that this is a case of a beneficial environment (Haas, Aulbur, and Thakar, 2003) within (Ackerman, Pipek, and Wulf, 2003).

Another example of a beneficial environment is the one of Toyota who has established a knowledge sharing network with its suppliers by devising methods to motivate members to participate and openly share valuable knowledge, by preventing free riders and by reducing the cost associated with finding and accessing different types of valuable knowledge, such that production knowledge is viewed as the property of the network. Suppliers do learn more quickly after participating in Toyota's knowledge sharing network and organizational learning is considered as a key factor in achieving sustainable competitive advantage (Dyer and Nobeoka, 2000, p.345). Dyer defines 'learning routine' as a regular pattern of interactions among individuals that permits the transfer, recombination, or creation of specialized knowledge. The learning capability invested in Toyota suppliers has been enabled by the creation of the environment of knowledge sharing among Toyota's network members. Hence, it has been suggested that organizations that are effective at 'learning' have developed routines that allow them to effectively develop, store and apply new knowledge on a systematic basis. Organizational learning would be expected to occur when firms develop 'adaptation routines' that allow the firm to modify existing routines based upon new knowledge – such as what would come in the process of knowledge sharing with fellow-suppliers as well as with Toyota itself.

One of the leading industries in the implementation of knowledge management is Buckman Laboratories¹. Top management at Buckman Laboratories take knowledge leadership seriously, insisting that "the climate we create as leaders has a major impact on our ability to share knowledge across time and space". Bob Buckman (the president of the company), recognizes trust as one of the company's core values. "For knowledge sharing to become a reality, you have to create a climate of trust in your organisation". Knowledge entrepreneurship is rewarded, and inquiry and innovations are promoted. According to a study conducted by APQC, the knowledge management strategy at Buckman Laboratories can be classified into two parts:

- The ability to access, develop, and deliver in the shortest amount of time a quality solution derived from the broadest possible knowledge base, will increase customer satisfaction and confidence in a supplier.
- Associates must be empowered with knowledge so they can satisfy the needs of customer faster and better than the competition.

The task for the organization is to continuously create and maintain a knowledge-enterprising culture and community whereby associates feel comfortable with knowledge and are motivated, rewarded and entrepreneurial. Equally challenging, is the task of developing a knowledge-focused reward system that can effectively replace the traditional, commission-based reward mechanism (Pan and Scarbrough, 1999, p.371).

3.3.7 Culture as a component of the environment

Much has been written about the dependency of knowledge management on the level of organizational culture in the company. The author has also related to it when referring to some of the factors presented in chapter 6. Culture has been defined as the visible and less visible norms, values and behaviour that are shared by a group of employees which shape the group's sense of what is acceptable and valid. These are generally slow to change and new group members learn them through both an informal and formal socialization process (Wilson, 2001, p.356 cited in Carpenter and Rudge, 2003, p.90). Wilson talks about groups so that he considers having many cultures and sub-cultures within one company. Hofstede (cited in (Maull, Brown, and Cliffe, 2001)) deals at a higher level with national culture which is a collective programming of the mind, distinguishing the members of one category of people from another. He sees it in an onion type model incorporating values, rituals, heroes, symbols, structures and systems and competencies in a series of concentric circles. (Maull et al, 2001, p.307) summarizes it as "The core of the culture is formed by values

¹ Buckman Laboratories, located in Memphis, Tennessee, is a leading manufacturer of specialty chemicals for aqueous industrial systems. The company was founded in 1945 on its unique ability to create and manufacture innovative solutions to control the growth of micro-organisms. Today the company provides complete specialty chemical solutions for the pulp and paper, water treatment, and leather markets. The company has annual sales of \$429 million, produces 500 different products, and employs over 1,400 people working in more than 90 countries. Buckman is recognized in 2005 North American MAKE study for its collaborative enterprise-wide knowledge sharing and organizational learning. In 1989, Bob Buckman made a personal pledge that knowledge would become the foundation of his company's competitive edge. Buckman Laboratories is a four-time North American MAKE Winner (including twice overall winner).

which are broad tendencies to prefer certain states over others and are the deepest level of culture. Rituals are collective activities that are considered essential, and heroes are persons who possess characteristics that are highly prized. Symbols are the most overt element of culture and are the gestures, objects or words recognized by those who are part of the same organizational culture". Four dimensions have been identified, into which each of the national cultures can be placed (Hofstede, 1980, cited in Wallace, Hunt, and Richard, 1999, p.549):

- Individualism¹ (the extent to which people are oriented towards self-interest versus an orientation towards the interest of a wider group of which they are part).
- Uncertainty avoidance (the extent to which people seek to minimize uncertainty versus the extent to which they are tolerant of ambiguity).
- Power distance² (the extent to which relationships between superior and subordinate are distant and formal versus close and informal).
- Masculinity (the extent to which success is defined in terms of assertiveness, challenge and ambition, rather than in terms of caring and nurturing).

Hofstede (1980) identified six dimensions of practice in organizations:

- Process-oriented versus results-oriented.
- Job-oriented versus employee-oriented.
- Professional versus parochial.
- Open systems versus closed systems.
- Tightly versus loosely controlled.
- Pragmatic versus normative.

Other factors affecting an organization's culture were identified by Wilson (2001):

- The business and market environment³ as well as the traditions of the industry.
- Leadership⁴.
- Management practices, the formal socialization process, the use of groups, and reward systems⁵.
- The informal socialization process, through which "myths stories and legends" are passed on to new employees.

Carpenter & Rudge (2003) realize that the implementation of knowledge management and specifically knowledge sharing is dependent on the organization's culture. Quoting Wilson (2001), he claims that cultural change in organizations is mostly only superficial change, and the underlying organizational values may not have changed. The role of management is to identify and manipulate the culture-influencing factors that would motivate

¹ This relates to one of the factors the author investigates in chapter 6 (the "division's self perception").

² This reflects on part of the relationship between the GM of the division and his knowledge manager as it has been discussed in chapter 4.

³ The author has identified the business situation of the division as being a factor described in chapter 6.

⁴ Part of the "management support" factor identified in chapter 6.

⁵ Related to in chapter 6 as part of the 'program performance' and 'initiative' factors.

employees to re-examine and potentially change their own assumptions and values. Managers also have to review their own values and assumptions. McDermott (McDermott and O'Dell, 2001) quoted the findings of a survey conducted by the American Productivity and Quality Centre (APQC) and summarized that:

- To create a knowledge sharing culture, make a visible connection¹ between sharing knowledge and practical business goals, problems or results.
- To make knowledge sharing a natural step, think how effective change happens in one's organization and match its overall style.
- Link sharing knowledge to widely held core values².
- Human networks are one of the key vehicles for sharing knowledge. To build a sharing culture, enhance the networks that already exist, enable them with tools, resources and legitimisation.

3.4 Success factors for implementation

(Davenport et al., 1998; Liebowitz, 1999, cited in Alazmi and Zairi, 2003) define some of the areas in which satisfactory results ensure successful competitive performance, and call those areas critical success factors (CSFs).

Alazmi quotes also other definitions for CSFs as "the areas where things must go right for the business to flourish"; "what the organization must accomplish to achieve the mission by examination and categorization of the impacts"; "the minimum key factors or sub-goals that the organization must have or need, and which together will achieve the mission"; "the few things that must go well to ensure success for a manager and/or organization".

CSF	Percentage
Sharing	17
Technology infrastructure	17
Top management support	15
Knowledge strategy	12
Training	10
Culture	10
Transferring	7
Creating	7
Knowledge infrastructure	5

Table 3-3: CSFs called by authors (modified from (Alazmi and Zairi, 2003))

Alazmi quotes 15 sources and gathers 61 CSFs (see appendix 2), he divides in nine categories by the amount of their usage by these sources, as shown in table 3-3. Nine of the 61 CSFs are comparable to those that have been used in this research (see section 6.1.4).

(Liebowitz, 1999 cited in Wong and Aspinwall, 2005, p.65) proposed six key ingredients for making KM successful, based on lessons learned from leading companies in the field (items in this chapter with an asterisk (*) are success

¹ This has been shown to be one of the central pillars of the IAI KM program.

² This has been addressed in chapter 4 as the author describes IAI values.

factors close to those used for this research or related to in the questionnaires used). They suggested the need for a KM strategy* with support* from senior management, a Chief Knowledge Officer* (CKO) or equivalent and a KM infrastructure*, knowledge ontologies and repositories, KM systems and tools, incentive to encourage knowledge sharing and a supportive culture*. (Davenport et al., 1998 cited in Wong and Aspinwall, 2005, p.75) hypothesized that the most important factors for KM implementation in large organizations were culture*, organizational infrastructure*, motivational aids, and management support*. Wong and Aspinwall investigated the issue in the SME sector and found the following list (in descending order) comprising some of the same attributes, though in a different order: Management leadership and support*, culture*, strategy and purpose*, resources, processes and activities*, training and education, human resource management, information technology, motivational aids, organizational infrastructure*, measurement*.

"Knowledge dissemination is defined as the process and extent of technological¹ information exchange within a given organization" (Bij, Song, and Weggeman, 2003p. 164). Bij *et al.* claims that knowledge dissemination is important for the new product development process. Having collected from the literature 17 factors for enhancing the level of knowledge dissemination, Bij *et al.* have consulted seven knowledge-intensive organizations and reduced this number to the ten most important ones. They then tested them empirically in 277 US high-technology firms at the strategic business unit (SBU) level. The factors are presented in order of importance in appendix 3, and six of them, are comparable to those that have been used in this research (see section 6.1.4). The results of the Bij research show that most important factors have been confirmed as significant and are people-related so that they are basically changeable. The factors about IT and organizational redundancy have not been confirmed. It is interesting to notice that the three leading factors (individual commitment, organizational crisis, and risk-taking behaviour) have in common that the occurrence of disruptive events is stimulated. These events may lead to higher loyalty to the organization and its members and to new knowledge that is worthwhile to disseminate.

(Chauvel and Despres, 2002) reviewed surveys on knowledge management and deduced the following enablers (success factors) for the implementation of knowledge management:

- Awareness of the value of knowledge assets.
- The significance of their role in the company.
- The existence of a KM strategy*.
- KM strategy integration with corporate strategy*.
- The commitment of top-level management*.
- The components of a knowledge-sharing culture*.

(Herder et al, 2003) have identified 17 success factors (they call critical), divided into three categories:

¹ The author questions the limitation to technological information and argues that it would apply to other types of information as well.

- Critical 'trigger' factors making **people**¹ aware and motivated:
 - Awareness
 - Strategy*
- Critical 'alignment' factors aligning knowledge **processes** to existing business processes:
 - Leadership*
 - Business benefits*
 - KM goals related to business goals*
 - Organizational capability – culture*
 - Organizational capability – structure*
 - Organizational capability – process*
- Critical 'feature' factors making **tools** available, easy to use and supportive:
 - Information and communication technology (ICT) infrastructure
 - Simple and easy
 - Facilitating role for ICT

In a qualitative case study about the role of motivation for knowledge transfer, (Kalling, 2003) identified additional success factors. The nature of the transferred knowledge is often addressed as an important factor; the more tacit and complex, the more difficult it becomes. The more ambiguous the causes and effects of the knowledge, the more difficult it is to transfer. The cognitive abilities of both the source of knowledge and the recipient are key factors. Absorptive and retentive capacity of the recipient is of course central in transfer situation. Furthermore, the value of the stocks of knowledge at the source is a potential factor. Another factor, related to competitive advantage, is the uniqueness and inimitability of the knowledge. Drawbacks result from the articulation of knowledge necessary in order to be able to transfer it. Articulation requires simplification so this is another factor. Addressing organizational context, one would identify that geographical or perceived proximity helps intensify knowledge transfer. Intensive integrative practices such as cross-functional meetings further increase the chances of successful transfer. The richness of communication channels such as liaisons positions is another factor, as is the pre-existence of social sub-networks. Strategic similarity* also impacts transfer success. Furthermore, the perceived trust-worthiness of the source of the knowledge is a factor.

The study results show the need to consider factors connected to motivation and management control* principles, and factors with an organizational context*, besides the cognitive factors. Furthermore, cognitive factors, such as causal ambiguity and tacitness, and absorptive and retentive capacity, seem to be affected by motivation* so that motivation could be a factor behind cognition². Moreover, the differences in motivation seem to be affected by local perceptions* of transfer programmes, by the local aspirations and strategic ambitions, by the view on internal competition, and partly by the internal communication. The management control* factor can be seen as a way to

¹ People, processes, and tools are different expressions for the basic elements of KM stated as being culture, process, and technology.

² The act or process of knowing, including aspects such as awareness, perception, reason, judgement, and impetus to action (Allee, 2003).

create an incentive to learn; hence it is again connected to motivation. Horizontal communication* is desirable but difficult with a profit centre culture. Under such circumstances, local motivation is a make or break factor. Finally, if motivation is not in place naturally, management control routines and organizational context may substitute.

(Martensson, 2000p. 210), in a study about KM as a management tool suggests the following list of factors for its implementation:

- The linkage between the KM strategy and the organization's strategy*.
- Support from top management*.
- Communication*.
- Creativity*.
- Culture and people*.
- Sharing knowledge*.
- Incentives*.
- Time*.
- Evaluation*.

(Mathi, K., 2004) has researched the key success factors for knowledge management and came to the conclusion that they are:

- A culture of pervasive knowledge sharing aligned with organizational objectives*.
- Maintaining a KM organization* inclusive of leadership* with a vision, strategy* and ability to promote change; and a specialist team to aggressively manage knowledge property.
- Effective and systematic processes* creating a 'knowledge environment' with processes to capture the knowledge assets of the organization.
- Strategy, system and infrastructure* that establish a clear definition of all required KM elements.
- Measures* for the success of KM against pragmatic milestones.

It has been claimed that the prescription for managers might be summarized as being a framework for exploration as much as a prescription for improving practices and, hence, performance. As an example one can use the following set of 'key success factors' as suggested by (Skyrme and Amidon, 1997 cited in Armistead, 1999, p.145):

- A strong link to a business imperative*.
- A compelling vision and architecture*.
- Knowledge leadership*.
- A knowledge-creating and –sharing culture*.
- Continuous learning.
- A well-developed technology infrastructure.
- A systematic organizational learning process.

(Mason and Pauleen, 2003) argue that internal organizational aspects constitute the most significant barriers to knowledge management. The responses in table 3-4 were received from the question: *"What do you think are the greatest barriers to successful implementation of KM?"*

Broad factors	Specific factors	%
Organizational culture		45
	Culture*	41
	Organizational culture	17
	Trust	17
	Communication*	10
	Sharing*	7
Leadership		22
	Leadership*	60
	Management*	40
Education		16
	Lack of awareness	43
	Lack of vision	28
	Lack of understanding	28
Effort vs. reward		9
Technology		7
Knowledge complexity		1

Table 3-4: Barriers to KM implementation

In contrast one can see that the most significant drivers are external. The responses in table 3-5 were received from the question: *"What do you think are the main drivers encouraging organizations to adopt KM?"*

Broad factors	Specific factors	%
Competition		50
	Competitive advantage	46
	Productivity	38
	Peer pressure	16
Knowledge assets		28
	Staff turnover	48
	Intellectual capital	24
	Knowledge sharing*	19
	Intellectual property	9
Attainable results		14
	Results*	60
	Risk reduction	40

Table 3-5: Drivers of KM

In order to determine the priority of the barriers and drivers the following question was posed: *"What do you think is the most important factor in successful KM?"* Table 3-6 shows the priority:

Issue	%
Sharing*	27
Leadership*	23
Culture*	15
Trust	10
Motivation*	10
People	8
Awareness	2
Time*	2
Competition*	2

Table 3-6: Single most important factor in KM implementation

(Park, Ribiere, and Schulte, 2004) have investigated the critical attributes of organizational culture that promote knowledge management technology implementation success and found the following with a positive correlation (listed in descending order): sharing information freely, working closely with others, team oriented work, trust, fairness, enthusiasm for the job, autonomy, flexibility, supportive of employees, tolerance to failure, rule orientation, praised good performance, experimentation, demanding of employees, taking advantage of opportunity, having a good reputation, being exact, decisiveness, problem solving, adaptability, developing friends at work, being thoughtful, security of employment. A negative correlation (listed in descending order) was found for the following attributes: low level of conflict encouraged, being careful, socially responsible, stability, confront conflict directly, fitting in at work, respect for individual's right, being different from others, high expectation for performance, informality, being innovative, being result oriented, predictability, taking initiative, being easy going, compliance, risk taking, attention to detail, being competitive, being aggressive, being calm.

The actual performance of activities (listed in appendix 1), expected to have a positive impact on the competitiveness of the firm, and the way they are performed, would be a factor in the successful implementation of the programme¹ if performed methodically (Holsapple and Jones, 2004a).

In an empirical research over 1000 organizations, across three industrial sectors, regarding the factors influencing KM implementation, (Moffett, McAdam, and Parkinson, 2003) derived a model inclusive of the following factors:

- Macro-environment* – includes economic, technical and social agents of change.
- Organizational climate* – includes organizational structure, strategy, goals, culture, employee emancipation, change management and business improvement initiatives.
- Internal technical climate – includes technological infrastructure and response to technical change.
- Technical contributors – includes system standardization and compatibility, technical usability, and technological tools for KM.

¹ Holsapple (2004) actually takes the issue one step further and expects an improved competitive advantage out of the performance of the activities.

- Informational contributors – includes Information Fatigue¹, info-famine², knowledge silos, and information auditing.
- Personal contributors* - includes knowledge roles and skills, motivation and self-reflection, empowerment, communities of practice, collaboration, and innovation.

The outcome of the research was the following categorization of the organizations surveyed:

- 43% of the respondents seek KM through the internal technical climate.
- 27% of the respondents do not focus on any particular approach for KM attainment.
- 14% of the respondents seek KM through organizational climate influences only.
- 13% of the respondents have no current activity for KM implementation.
- 3% of the respondents pay attention to both organizational climate and internal technical climate for KM success.

Empowerment, mentioned in the Moffett, McAdam, et al. (2003) research is a factor by its own merit that was taken a further step forward in a study looking at it at the work-unit level rather than at the personal level. The concept of empowerment involves increased individual motivation at work through the delegation of authority to the lowest level in an organization where a competent decision can be made (Conger & Kanungo, 1988; Thomas & V cited in Seibert et al, 2004). From their conclusions the author chose the followings:

- Empowerment climate³ and psychological empowerment⁴ are empirically distinct constructs.
- Empowerment climate and psychological empowerment will be positively and significantly related.
- Empowerment climate will be positively and significantly related to work-unit performance.
- Psychological empowerment will be positively and significantly related to individual job performance.
- Psychological empowerment will be positively and significantly related to individual job satisfaction.
- Psychological empowerment will mediate the relationship between empowerment climate and individual performance.
- Psychological empowerment will mediate the relationship between empowerment climate and job satisfaction.

¹ Organization being IT over-mechanized.

² Organization being IT under-mechanized.

³ Empowerment climate has been defined as a shared perception regarding the extent to which an organization makes use of structures, policies, and practices supporting employee empowerment.

⁴ Psychological empowerment has been defined as an individual's experience of intrinsic motivation that is based on cognitions about him-or herself in relation to his or her work role (Spreitzer, 1995 cited in Seibert et al, 2004)

3.5 KM performance measurement

(Sveiby, 1997p.163) refers to two possible purposes for measurement depending on the party interested in the results, one being for external presentation to stakeholders, customers, creditors, and shareholders so they can assess the quality of the company 's management and whether it is likely to be a reliable supplier or a dependable creditor; and the second, being internal for management which needs to know as much as possible about the company so that it can monitor its progress and take corrective action when needed.

Measurement may focus on levels or on trends, both being important and needing to be adapted to the end user. Management information should emphasize flow, change, and control figures, while external presentations should include key indicators and explanatory text. As in all measurement systems, it is the comparisons that are interesting. A measurement tells nothing at all unless it is compared against a yardstick of some kind: another company, a previous year, or a budget (relative measurement).

3.5.1 Why do we measure

What is measurable is not worth measuring (Albert Einstein)

- Performance measures have been defined as the "characteristics of outputs that are identified for purposes of evaluation" (Euske, 1984 cited in Pervaiz, Kwang, and Zairi, 1999), or as a "tool" to compare the actual results with a preset target (Euske, 1984 cited in Pervaiz et al, 1999). In fact, performance measures should be defined depending on the perspective of the interested party, whether it is corporate, the local organization, the specific community, or even the individual. Performance measures should therefore "communicate how an activity is meeting the needs of internal or external customers" (Euske, 1984 cited in Pervaiz et al, 1999) and reflect the contribution of each team or process to the organization's goal.

Pervaiz et al. (1999) remark that rather than focusing on outputs, measurement should look toward the enablers leading to these results. Finally, measurement requires a medium to long term commitment from senior management not to create a local and temporary bias.

It has been argued that performance measurement systems are used to establish specific goals, align employee behaviour, and increase accountability. Organizations often use these systems to set targets for component units (profit centres, divisions, and even individuals) (Castellano, Young, and Roehm, 2004). This system suffers from a number of fatal flaws that can undermine its efficiency:

- Ignoring the performance contributions of interactive system elements: the goal should be to optimise the overall system, not its components parts, so it is important to recognize the inter-relationship between the components within the system otherwise the system view of the organization would be ignored and the measurement would be counterproductive.

- Misunderstanding variations: there will always be inherent variation in every system component – manpower, machines, methods, materials, and environment. Advocates of stretch targets and benchmarking ignore variation both in setting targets and in analysing results. In a stable process only random variations occurs and because all work is accomplished in processes, it is possible to obtain measurements of key performance indicators that show distribution over time and also its stability.
- Confusing signal with noise: the ability of process behaviour charts to give management a methodology to distinguish between signal and noise provides a statistically based method of analysis superior to traditional analysis.
- Misunderstanding psychology: the pressure 'to make the numbers' is given much more attention than the effect of the continued usage of stretch targets and benchmarking to produce figures one cannot trust, whenever 'there is fear' (Deming, W.E. 1980 cited in Castellano et al, 2004).
- Confusing the voice of the customer with the voice of the process: management, acting as the internal customer and setting up goals instrumental in management by objective or management by results initiatives, sometimes doesn't ensure that the process is capable at all of delivering such result. Best effort or proper incentives may not be enough and may encourage distortion of the results.
- Failure to support a process view: more and more companies are concentrating at process improvement techniques without updating their measurement technique from their traditional content.
- Misunderstanding the real role of measurement: measurement systems should focus on providing management with the feedback they need to monitor or improve key processes; the work itself and not measures, should define what is meaningful. As employees increasingly focus on the measurements, they disconnect from the larger purpose of the firm and do only what is required and measured.
- (Sveiby, 2002) states that measurement should only be aimed at value creation, neither for management control and nor for public relation.

3.5.2 Goal setting and metrics

Measurement is the least developed aspect of KM and best practice efforts because of the inherent difficulty to measure something that cannot be seen, such as knowledge. Standardized metrics are needed to quantify knowledge and to fully convince management and stakeholders as to the value of KM initiatives (Bose, 2004b).

3.5.2.1 Objective measurement

Carrion et al. (2004) have studied the relationship between critical knowledge areas and the firm's performance (see also section 3.3.3). They quote Edvinsson (1997) emphasizing that a company should only measure what is strategically important for growth.

Knowledge being considered as an intangible resource, practitioners of KM had a few alternatives available as measurement systems (Bontis, Dragonetti, Jacobsen, and Roos, 1999; Bose, 2004a):

- Human resource accounting – quantifying the economic value of people to the organization.
- Economic value added – a measure for the stock of intellectual capital and the return on it (Marchant and Barsky, 1997 cited in Bontis et al, 1999 p.395).
- The balance scorecard – a multi-dimensional measurement system inclusive of a financial perspective, a customer perspective, an internal business process drawing from the concept of the value chain, and a learning and growth perspective relating to employees and systems the company has in place to facilitate learning and knowledge diffusion (Kaplan and Norton, 1996 cited in Bontis et al, 1999 p.395).
- Intellectual capital – the collection of intangible resources, inclusive of human and structural capital, and their flows.

(Levett and Guenov, 2000) have compiled the following list of metrics for the implementation of KM in the automotive industry, but in fact it is generic enough to fit others: Motivation, knowledge capture, the usefulness of captured knowledge to solve problems, the effectiveness of employee learning mechanisms, knowledge transfer, creative thinking, knowledge identification, knowledge access.

The US department of the Navy has sponsored a study meant to establish the metrics for knowledge management initiatives. They concluded with three types of measures to monitor the KM initiative from different perspectives¹. *Outcome* metrics concern the overall organization and measure large-scale characteristics such as increased productivity or revenue for the enterprise. *Output* metrics measure project level characteristics such as the effectiveness of Lessons Learned information to capturing new business. *System* metrics monitor the usefulness and responsiveness of the supporting technology tools (Department of the Navy, 2001).

3.5.2.2 Relative measurement

Benchmarking and knowledge management are both recognized management techniques that have emerged over the last 25 years and become part of the Western business culture. Benchmarking is promoted as a way of improving business performance and competitiveness through one company measuring its practices against a defined 'benchmark' standard, and adapting itself accordingly.

(Jager, 1999) differs between competitive benchmarking (difficult as target companies usually do not cooperate), co-operative benchmarking (with 'best-in-class' firm not directly competing), collaborative benchmarking (between a group of firms on a certain subject), internal benchmarking (used to identify best-in-house practices), quantitative benchmarking (as much as measuring knowledge capital is difficult due to its intangibility), qualitative benchmarking

¹ Not to be confused with the three levels of measures implemented in IAI and described in section 4.5.2.

(comparing processes or practices). Arthur Andersen together with the American Productivity and Quality Centre developed a tool called the KMAT (knowledge management assessment tool) for qualitative knowledge management benchmarking. The KMAT model proposes a way for four enablers (leadership, culture, technology, and measurement) to foster the development of organizational knowledge through the knowledge management process.

Roth (2002) argues that the identified knowledge assets in a company which are clustered into stakeholder resources and structural resources are equipped with specific knowledge asset related indicators which allow for an assessment of the various knowledge areas (Marr et al., 2001 cited in Roth, N. G., 2002). Several institutions like the Global Knowledge Economics Council or the University of Regensburg are offering extensive lists of indicators which can be used for knowledge measurement. Most of the indicators refer thereby knowledge related activities like store, learning, knowledge diffusion, knowledge sharing or creation.

3.6 Chapter overview

The definitions of knowledge, its derivative as organizational learning and its attribute as being a 'new market value' have been examined to enable the presentation of their significance and the way it is represented in the context of knowledge management in the literature. The term knowledge has been investigated in its meaning as a 'thing' or as a 'process'. Studying the definitions of knowledge management, the author has differed between an epistemological approach and an ontological one.

The different characteristics of knowledge management at its different ages, stages, waves, or generations, (different terms for different researchers) are then presented; followed by KM strategies, KM frameworks, and KM styles. KM is viewed all along its life cycle to show the way it encompasses the business cycle.

The literature has been reviewed for the implementation aspect of knowledge management, and specifically its links to business strategy and its impact on the performance of the organization implementing it. The author has focused the literature research on KM's contribution to industrial processes, to R&D, and to management. Published examples from leading industries have been sampled.

The author has then researched the literature for publications on potential success factors in the implementation of knowledge management to be used in chapter 6 as an initial list of factors to be used in the research. Three main KM processes were reviewed as well as the intricacies of the task of the knowledge manager and the environment in which he performs.

The issue of KM performance measurement and management was then investigated. This is apparently a weaker subject, at least to the extent it reflects in the literature. The various means have been presented as well as the management tools of Hoshin Kanri and of self assessment of the implementation.

4 The IAI KM Programme

Israel Aircraft Industries is globally recognized as a leader in developing military and commercial aerospace technology. This distinction is the result of nearly half-century of designing, engineering and manufacturing, for customers throughout the world. www.iai.co.il

This chapter explains IAI, its relevant history and describes the KM programme in some detail, in order to give context to the research. The implementation of the KM programme has been preceded by a more comprehensive change programme that had paved the way for it. The design of the KM programme was based on the recommendation of the KM strategy, on well established frameworks for KM in the world, and on the change programme implementation experience.

4.1 Who is IAI?

Israel Aircraft Industries (about 15000 employees organized in 5 groups and 23 divisions) is globally recognized as a leader in developing defence and commercial aerospace technology. This distinction is the result of nearly half a century of designing, engineering and manufacturing, for customers throughout the world. IAI has kept along the last few years, sales figures of about 2 B\$ (over 80% of it as export) and an order book of over two years.

What strikes any visitor to IAI is the multiplicity of its fields of activity, the range of its products, and the variation in attitude to values one encounters across groups and divisions. This last attribute is of special significance when dealing with a soft issue as is knowledge management. Additional parameters expected to be relevant to the implementation of knowledge management in IAI, are the fact that the company as a whole is considered as R&D intense, that as any large corporation it is organized in groups, by themselves divided into divisions each having a bottom line target to meet, and that it is mature. This is a company established in the fifties, which started with aeronautical maintenance jobs, ventured into the development of a futuristic fighter aircraft the Lavi was, and is now developing and positioning satellites in space.

4.2 The competitive advantage initiative

Back in 1998, IAI looked around in the Defence and Aerospace community and realized that most of the leading companies of the US and of Europe, have invested in improving their operational efficiency. This was based essentially on analysing operational processes to minimize any content not contributing value to the customer. Different companies gave their programmes different names:

- B.F. Goodrich was probably one of the first when they referred to their programme in 1994 as a 'Lean philosophy'.
- BAE followed in 1995 with a benchmark programme.
- 'Six sigma' programmes, referring of course to the minimization of wasted effort and of faults in the production of goods and services

were the next name used, by GE in 1996, Bombardier in 1997 and Raytheon in 1998.

- Boeing followed with an 'Advanced quality system', Pratt & Whitney with ACE (Achieving competitive excellence), and Rockwell Collins with 'Lean electronics initiative' in 1998.

IAI called their programme 'The Competitive Advantage Initiative' (CAI) and for two years, it was instrumental in the discovery of 'waste' wherever employees of the company at various managerial levels decided to expose it. People usually know what is less than perfect in their activity and correcting it is a question of priority.

The CAI programme concentrated on two measures and on what it took in terms of optimising processes, to maximize them:

- Due date performance – not advancing and certainly not delaying contractual delivery schedules.
- First time quality – passing customer's acceptance test on the first occasion given.

4.3 The value and behaviour change

IAI realized that its policy of decentralization has created divisions eager to show their success at the bottom line sometimes to the detriment of other divisions, and that it has to leverage its capabilities as one company¹.

Under the leadership of IAI's CEO, and the active participation of his COO and EVP, the 'value and behavioural change programme' of IAI was established² in the year 2000, because 'sometimes, improving is not enough'. The programme started with the creation of a staged system of teams (T) comprising of the various management levels in the company (each team including the preceding ones):

- T1 – being the CEO himself.
- T17 – for the group general managers, the vice presidents, and the officers of the company.
- T50 – for the general managers of the 23 divisions and additional HQ managers at the same level.
- T300 – for the directors of the 23 divisions and additional HQ managers at the same level (respectively reporting to the T50 level).
- T1000 – for the section chiefs of the 23 divisions and additional HQ managers at the same level (respectively reporting to the T300 level).
- T14000 – being each and every employee of the company.

T17 drafted the company vision. For an organization having been established for 47 years, it was quite a compelling exercise (see figure 4-1).

T17 was then given the task of establishing the company values, limiting them by the CEO to three only. The first and second ones – Customers and People, were chosen quite naturally. The third choice was more challenging because by picking Innovation and Technology, one deliberately did not

¹ Quoted from an interview with the VP for R&D and Strategy, within his organization the KM program is being performed.

² In direct comparison with the KM program which is lead by the VP for R&D and Strategy and managed by the director of knowledge for the company.

mention Quality, Value to the shareholders or other equally valuable entities. The CEO approved the choice but then added a supplementary value to provide for the synergism of IAI as One Company (see figure 4-2).

COMPANY VISION

Together we will grow the core business of IAI for the benefit of our customers, our people, and our owners.

This **growth** will be achieved through innovative technological systems, products, and services of the highest quality.

Our **people** will grow through a climate of complete integrity and excellence in everything we do that will become a model for others.

Figure 4-1: Company Vision

T50 was then divided into four teams, one for each value, and their task was to put content in them by defining them and proposing a limited set of three to four actions that would most effectively realize each value.

This was performed using a brainstorming technique of dealing with dilemmas about the potential reasons for the actual behaviour, what could be the desired deeds, and the recommendation for possible actions to attain the realisation of the value or in other words, to upgrade its banner status to a real world standard.

IAI's VALUES

Our Customers

Satisfying our **customers** is the reason for our existence and the source of our growth.

Our People

By working together, the **people** are the key to our growth. They are the company's most valuable asset and will always be treated as such.

Innovation and Technology

We will encourage all the people in IAI to seek **innovative** ideas in everything that we do. Our **technology** edge is a foundation for satisfying customers and for our growth.

One Company

IAI is **one** company operating as a unified organization and appreciated as such by all who do business with us.

Figure 4-2: IAI values

The change programme ingrained in the company's culture, notions of introducing goals within a value context, setting up targets and following up gaps in their achievement, and implementing actions to close those gaps.

Having accumulated some experience with the change programme has paved the way for the acceptance that:

- It is permissible to have intangible goods (such as customer intimacy, communication and involvement, learning organisation or knowledge management) as long as it is backed and supported by concrete, tangible and measurable actions.
- It is permissible to find non-direct way to achieve results.

This created an environment more favourable to the implementation of a programme which incorporates intangible goods:

- KM actions are expected to deliver performance goals.
- A mental link is created with individuals between intangible goods and the use of ethereal or tacit knowledge.

Such an environment, in which terms such as internal communication and knowledge sharing are not new to people, is expected to be more approving for the implementation of KM processes as 'communities of practice', or 'good practices'.

4.4 The IAI KM programme

Knowledge management was chosen by the Innovation and Technology team as one of its actions. Though KM was established as only one of those actions, it was clear that it would affect practically all of the values and that its content would need to be defined in order to discover these relationships. The feeling was that it would include the cultural dimensions of information cooperation between various functions and especially within engineering or between it and production; processes among which communities of practice was sure to have a place; and of course technology to help manage it. It was expected that different meanings between the various functions of IAI for the definition of knowledge or of knowledge management would be found.

The strategy for knowledge management in IAI was set with the help of a consulting team comprising of Dr. Edna Pasher (Edna Pasher PhD & Associates¹), Dr. Ron Dvir (Innovation Ecology²), and Moria Levy (ROM Knowledgeware³), for the following goals:

- Improving the availability of knowledge to IAI employees.
- Organisation learning from failures as well as from successes.
- Cultivating the potential for the creation of new knowledge.
- Enhancing knowledge sharing among IAI employees.
- Increasing the awareness to knowledge management.

One can discern in those sentences the buds of the framework for the KM programme in IAI, yet to be initiated. The KM strategy was worded in its vision (see figure 4-3).

¹ <http://www.pasher.co.il>

² <http://www.innovationecology.com>

³ <http://www.kmrom.com>

A director of knowledge was appointed at the company level on a full time basis, reporting to the VP for R&D and Strategy and was requested to design the programme based on this strategy and on the following requirements stated as having an important role in the content of the programme:

- Fitting the KM programme in IAI's operational processes.
- Addressing the cultural aspect of KM.
- Prioritising on a final list of processes and tools.
- Designing the organisation to back up the programme.
- Specifying the technology package to support the KM programme.
- Establishing the control and monitoring process of the programme.

The Knowledge Management Vision

*New Knowledge
Will be created,
Shared,
And reused,
As part of IAI personnel's common practice,
For the achievement of IAI's vision
And the fulfilment of its goals*

Figure 4-3: The KM vision

4.4.1 The life cycle of knowledge

The author, in his position as director of knowledge for the company, has established the concept of the life cycle of knowledge around the goals of the knowledge management strategy enumerated above. Knowledge management was established then as a comprehensive programme including all four phases of this life cycle:

- Knowledge capture and documentation.
- Knowledge retrieval for reuse.
- New knowledge creation.
- Knowledge sharing.

Once this was declared, it became very clear that the knowledge management single action for the "Innovation and Technology" value was no longer adequate. In fact, knowledge management discovered significance in other defined actions within the overall change programme.

The purpose of knowledge management being to foster innovation and to create and share knowledge in order to promote business goals, it was therefore defined as the process of identifying, capturing, leveraging and creating knowledge to deliver value to customers¹. The ultimate goal of the knowledge management action (as all other actions within the change programme) is to achieve a required competitive advantage. Specific procedures to perform the required activity and to measure their influence and possibly their concrete effect on business results were phrased out for each phase.

¹ To be compared to other definitions in section 3.2.2 of the literature review chapter.

4.4.1.1 Knowledge capture and documentation

This is the basis of knowledge management. Without it, there is no room for retrieval and reuse. IAI employees gather a great deal of knowledge along their work – professional knowledge coming from experience, knowledge about processes, about projects, about the external environment (customers, suppliers, opportunities), or about company products. Knowledge could also be extracted from lessons learned if there was awareness to the immense value embedded in them. In many cases, this knowledge remains with the expert and is not available to others. Knowledge capture and documentation enables the extraction of this knowledge to become a strategic asset by replacing tacit with explicit and personal with organizational. Documentation paves the way for taking care about the organization of documented knowledge.

4.4.1.2 Knowledge retrieval for reuse

Retrieval and reuse of existing knowledge prevents from reinventing the wheel time and again, prevents from reiterating previous mistakes and enables the duplication of successes; thus, fostering professionalism, making processes more efficient, and diminishing development cost and time to market. This phase will be home for the materialization of what is sometimes referred to as the organizational memory, attributed to the 'first generation'¹ of knowledge management' (McElroy, 2000).

4.4.1.3 New knowledge creation

In a time in which competition constantly increases and in which time, quality and budget are of essence, knowledge creation and innovation are a vital necessity of any organization and the capture and reuse of existing knowledge are no longer sufficient to cope with the rate of growth necessary for the organization to stay ahead of the competition. This phase deals with new knowledge whether it grows within the company, or if it is imported to it.

4.4.1.4 Knowledge sharing

In a competitive market, in which time-to-market is constantly shortening and competition is about alertness, price, innovation, and professionalism, knowledge sharing within the organization is an essential condition to its sustained success. This is especially true for a company as decentralized as IAI is, where knowledge is created and used in many separate competence centres dispersed around its divisions. This is sometimes referred to as the second generation² of knowledge management which values knowledge only if it flows between people as in the sharing process (McElroy, 2000).

4.4.2 The knowledge management procedures

Knowledge managers were appointed for each division and HQ organization. The knowledge managers convene once a month, each time in a different division, to get insight about local successes and difficulties and to discuss

¹ (See details in section 3.2.3).

² (See details in section 3.2.3).

common issues related to the implementation of the programme. At one of the first of these conventions, the knowledge managers were presented by the director of knowledge with the approved strategy and with a set of examples from around the world. They voted for a set of procedures to support the four above-mentioned phases. The process was based on the recommendation of Mr. Arian Ward¹ to start with what would be important to the users. The procedures were:

4.4.2.1 Knowledge capture and documentation

The procedures for this phase are:

- **Disciplinary knowledge capture:**

It is not unusual, to have in each and every discipline, people who concentrate tacit knowledge critical to the organization. Knowledge capture is the methodical procedure of identifying this knowledge, convincing the owner of documenting it, and making it available to members of the organization.

- **Knowledge extracted from lessons learned:**

Lessons learned are an expression of experience, whether good or bad. Organizations sometimes take the initiative of debriefing an event because it looks significant to them. The outcome of such processes is a list of lessons learned. In fact, a structured and organized debriefing event is not the only source to lessons learned. These could also be the results of most reviews and professional meetings, and if one is attentive enough, they populate our everyday life with good or bad experience that one goes through. The methodical practice of identifying the lesson learned, its generalisation to enable it to be applicative to a wider audience than the one involved with the original event, and its publication is the context of this procedure.

- **Content management:**

Documented information is organized in the company's repositories according to the approach of the documenting function. The result is a proliferation of organizations of information that do not ease the navigation over them by the searcher of information not familiar with the specific orderliness he is encountering. To facilitate the exploitation of documented information across the company and not necessarily by the function that saved it originally, a set of terms common to the company was established, and a systematic process for categorizing each piece of information and relating it to those terms was introduced. The result is an important step forward in materializing the 'one company' value. The content management procedure deals with the building of this structure and its implementation and usage in the company.

4.4.2.2 Knowledge retrieval for reuse

The procedures for this phase are:

- **Fostering the knowledge of core competence centres:**

¹ Arian Ward is a partner in Community Frontiers, a company focusing on helping groups come together around a shared purpose grounded in the spirit and practice of community so that the groups become places of realized potential. Arian is former Leader of Collaboration, Knowledge & Learning for Hughes Space & Communications (HSC; now part of Boeing Satellite Systems). In this role, he led HSC's efforts to understand, manage, leverage, and expand its human capital.

Competence centres are representing a capability residing in the company, whether in a specific division or dispersed among a few of them, to translate knowledge into a competitive advantage which may have successful business results. The procedure of fostering the knowledge of competence centres deals with the mapping of the gap between what the centres know in a tangible and managed way and what they should have known based on the market requirements; and with the process of bridging that gap.

- Establishing a business and technological knowledge base:

Divisions employ managers in charge of activities whether in the business field or in the technological one. To perform those activities, they all gather information relevant to their tasks but disregard the significance it may have to colleagues in the division or in the company. This procedure deals with the methodical establishment and management of a virtual common repository both for the technological information as well as for the business one in the division. Furthermore, it deals with enabling the availability of at least part of that information across the company to other divisions.

4.4.2.3 New knowledge creation

The procedures for this phase are:

- Knowledge extracted from the innovation process:

The present situation is characterized by an acute need for competitive advantage dictated by an ever increasing competition for time-to-market, price and performance. Innovation more and more plays an important role in the equation for improving the competitive advantage. Capturing and retrieving existing knowledge is no longer a sufficient solution and companies have to concentrate on the creation of new knowledge as well. One way of doing it is by encouraging employees to innovate in anything they normally do or to suggest possible innovations in other fields and another is by importing knowledge into the company. This procedure's aim is to manage the new knowledge created or imported into the company.

- Knowledge in the new product initiative process:

Projects are the main stream of activity in IAI. People are involved in projects using the Integrated Product Team (IPT) concept that constructs teams as needed by the project dependent on its specific actual phase. People are coming to this phase with previous knowledge (standards, references, experience from previous similar projects and lessons learned), and conclude their participation at the end of the phase with additional experience. The management of this knowledge is the content of this procedure.

4.4.2.4 Knowledge sharing

The procedures for this phase are:

- Communities of practice:

With 23 divisions in IAI, it is not unusual to find the same technology being developed for different applications in various divisions. Aiming for improving the general technological knowledge, gaining advantage from a larger base of activity, and sharing methods and practices, communities of practice are organized. Actually, they are consisting of a group of people having a common technological subject, who self-organize voluntarily, vote for a

leader, and decide for a set of goals to govern their activity. The community of practice procedure manages the process and induce the divisions to encourage their employees to join the communities.

- Generating good practices:

The identification, methodical analysis and learning, improvement and publication of methods, tools and practices across the company are the content of this procedure. The term usually used is best practices. IAI has preferred to use the more minor and modest term of good practices and reserve 'best' for practices that are truly shared by many divisions, and for a sustainable period.

- Using the IAI-Net to share knowledge:

Divisions' homepages should perform as virtual workplaces in which employees would find the information relevant to their everyday work and where they would be able to react to it. In too many cases, the company's Intranet isn't but a management bulletin board for one-to-many publications. This procedure is meant to induce the knowledge managers to transform their division's homepage and to use it more for knowledge sharing.

4.4.3 The roles participating in KM implementation

We have limited the research to inquiring upon the implementation process of the knowledge management programme in the divisions of IAI (and disregarded headquarter organisations, group organizations, or others). The main roles involved in the implementation are therefore the general manager of the division, his knowledge manager, the company's director of knowledge, and the division's personnel who represent the environment the programme operates in (see figure 4-4).

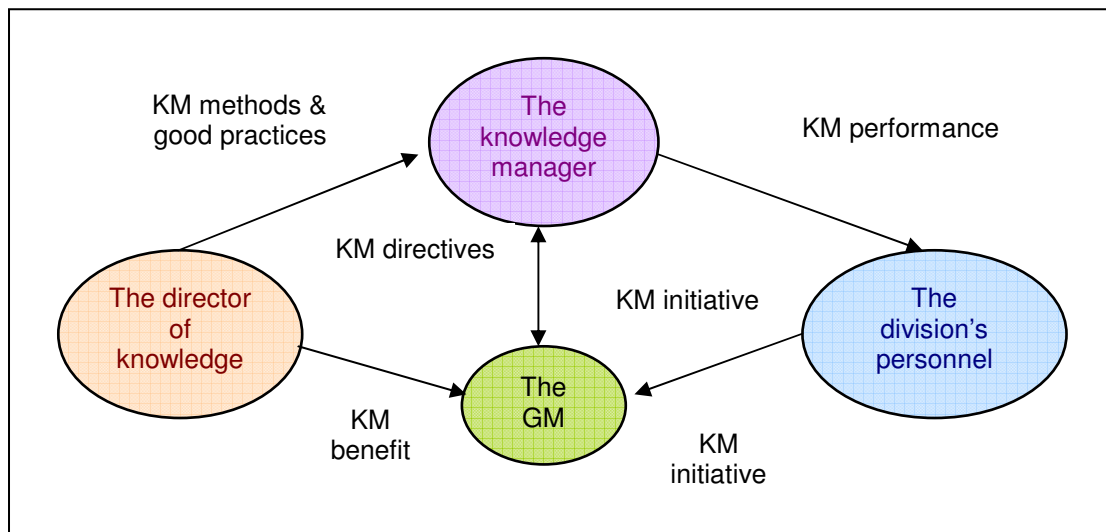


Figure 4-4: The roles participating in KM implementation

4.4.3.1 The division's GM

The division's GM is the customer of the programme and of the company's director of knowledge. His division's performance and business results are to be improved by the effects of an implemented KM programme and if he is not

convinced about it, the most the programme can expect from him is a passive participation, only due to obedience with corporate requirements. This will definitely not be enough for the programme to overcome the competition for resources and management attention and it will eventually fail.

4.4.3.2 The division knowledge manager (DKM)

The division's GMs and the HQ organisations' VPs were requested to appoint their knowledge manager (about 30 people all together), to initiate and coordinate the KM activities with reference to the specific needs of the organisation, and forming their interest for knowledge management. The appointment was done on a part time basis, expressly in order not to create a position disconnected from the concrete activity of the organization and to keep KM strongly related to it. The main tasks of a typical knowledge manager for the GM to choose in focusing his activity were published as:

- To enhance the awareness and proficiency in KM performance.
- To capture and document knowledge using a content management structure standard to the company.
- To create insight from lessons learned out of the debriefing processes established within the One Company value.
- To foster the competence centres knowledge basis so that they can be a source of reuse.
- To facilitate the establishment of the division's technology and business knowledge bases so that they can be interconnected to the company knowledge bases.
- To promote the creation of new knowledge either through the initiation of new products, through the promotion of innovative ideas, or by importing new knowledge to the division.
- To organise communities of practice, preferably of multi-divisional nature.
- To help identify, improve and publicize good practices for the company knowledge and usage.
- To lead the usage of the division IAI-Net site as a sharing point for knowledge within, from and into the division.
- To act as an integrating factor from the division content point of view and toward the IT function of the division.

Once appointed by the division's GM, it is the division knowledge manager who is committed to the programme and reports to the GM to the extent requested.

The knowledge managers were appointed from a population of R&D managers, IT managers, change champions or engineering managers¹. The degree of their involvement in the programme (time wise and in creativeness) as well as their personal and professional profile² will prove to be of essence for the success of the KM programme.

¹ To be compared with the profile sketched in the literature as in section 3.3.5.

² To be compared with the profile described as a success factor in section 6.1.4.6.

4.4.3.3 The division's personnel

The division's personnel belong to various groups. They can either be part of project organisations, professional competence centres, or are representatives of functional HQ organisations.

- People of the first and second groups can be influenced toward KM activity through their professional circles but are also directly affected by the division's business performance.
- People of the third group, can be influenced toward KM activity through HQ organizations directing the function they are responsible for within the division or through exposure to published activity by benchmarked companies. The result can be one of personal KM performance that may even spread within the department and possibly even further away and sometimes even be praised publicly to credit the division for it.

Nevertheless, we haven't researched the division's personnel as playing a role or any deeper than representing the environment for the implementation of the KM programme.

4.4.3.4 The director of knowledge (DoK)

The programme approved by IAI management included the appointment of a full time director of knowledge, who operates under the auspices of the VP for R&D and Strategy. His customers are the divisions' GMs to whom he is supplying the knowledge management added value, and the knowledge managers to whom he is a facilitator and a supplier of methods, processes, world best practices and experience for the application of knowledge management.

The director of knowledge represents top corporate management in general and specifically the VP for R&D and strategy. He is also considered as the expert in the field and can influence KM activity from benchmarking with other industries or from inner comparison between divisions.

The profile and background required for the director of knowledge were never specified but considering the character of the programme at its initiation and the orientation of the environment in which it was conceived – the office of the VP for R&D and strategy, it is clear that it didn't emphasize neither a human resources affiliation nor an information technology background but rather a process state of mind with an engineering management background¹.

The company's director of knowledge has designed the programme, is in charge of it, and is the author of this research. Participative action research considerations therefore apply, as he undeniably influences the implementation of the programme, but only to the extent enabled by the division's knowledge manager.

The first year of implementing the KM programme was used for the assimilation of the proper terms across the company. For this, the KM handbook had to be written and validated by teams of knowledge managers

¹ The author, who has been the first director of knowledge chosen for the job, was previously the deputy GM of one of IAI's divisions.

(the process part¹ of KM), divisions would implement only one process out of each chapter, and knowledge managers would compare notes on a monthly basis (the culture part of KM). Technology was left for latter.

The second year of the implementation, (the first of the two years consisting of the research period) reached for a goal much more pretentious – to establish the notion of a company domain. This means that there is no such thing as local, project, or division knowledge and that it is all IAI knowledge. That also means organizing all documented knowledge using categories and hierarchy trees standard across the company. This involves technology at a much deeper level but would not be ventured if the concepts of capturing knowledge, retrieving it for reuse and sharing it were not already known across the company.

Anything done within the KM programme is being discussed and decided by the knowledge managers at their monthly meetings. This does not preclude of course, decisions to be directed by the director of knowledge who leads those meetings.

Two years after launching the programme, (during the second year of the research period), the director of knowledge ventured into holding a reassessing session with all the knowledge managers. The key to a good stock-taking session resides in the group memory, especially participants' insights into patterns of development. There is a wellspring of knowledge that comes out of any group, especially if all members add to the collective wisdom. The assumption was that the knowledge managers were mature enough in experiencing the process to relate to it, criticize it and move forward strengthened by the session.

4.4.3.5 The interaction between the participants

The director of knowledge is responsible for the implementation of the programme toward the VP for R&D and strategy. He is being monitored using a management by objective (MBO) method. On the first year of implementation (2003) the objective was to meet with the management (at the T300 level) of every group, division, and HQ organisation and to present the programme. This has actually been performed until the middle of the year. On the second year of implementation (2004) the objective was to establish five technological communities of practice. 11 were formed by the end of the year. On the third year of implementation (2005) the objective was to start working on ten competence centres. The knowledge of 20 of them was mapped by the middle of the year. The director of knowledge supplies the GMs with a structural way of performing the programme, and with examples and good practices from around the world. He is following the programme in all organizations along the year using the on-line report of the PDM², is reviewing it with the knowledge manager and the knowledge leaders on a quarterly basis, and conducts a mutual assessment once a year.

The GMs decide on the division's goals and approve the KM plan submitted by the knowledge managers. They receive inputs and feedback from the

¹ Related to the legendary threefold structure of KM comprising of culture, process, and technology.

² Described in section 4.5.

division's employees, could adapt the programme accordingly, and are periodically following up the implementation.

The division's knowledge manager performs the programme with the help of knowledge leaders who operate within their own directorates at the employees' level.

4.4.4 The implementation plan

4.4.4.1 Programme content, balance, and timing

In dealing with the implementation of a KM programme, one would expect that importance has to be given to the programme content; balance and timing (presented as one of the factors related to the director of knowledge in appendix 5). The KM programme implementation plan was twofold:

- The long term plan (covering the years 2002-2007).
- The yearly plan governed by the PDM.

The multi-year programme started with the nomination of the knowledge managers in 2002.

In 2003 the plan has been to introduce the values of knowledge management, of capturing tacit knowledge, of reusing it instead of reinventing it, of sharing it and of continuous innovation, while the introduction of tools and technological solutions was delayed to a latter point. The plan has also been to publicize the programme by lecturing about it in all organizations at the management level. This was done together with the organization knowledge manager who joined in the presentation with locally applicative examples. In this year the plan was to establish three communities of practice. To prepare for future usage of technological solutions, 2003 was also allocated for the testing of a federated search engine, the definition of the KM related specifications of a document management system, and laying the foundations for the construction of the structure needed for the content management procedure. The director of knowledge had by this, created a twofold way to improve the accessibility to company information – navigating to it using the content of the information enquired about, and searching it when there are cues for it. In this year the plan was also to define the matrix for the self and mutual assessment which was to be conducted at the end of the year.

2004 was to be the year of the communities of practice and the intention was to establish five technological communities; the plan was also intended to continue in the definition of branches and categories for the content management concept; and finally, the decision was to purchase on this year the federated search engine.

The year 2005 (after the research period) was dedicated to the fostering of the competence centres and to the implementation of the content management concept.

In 2006 (after the research period) the intention was to materialize the plan for the technological and business data-bases and to extend the KM programme toward the extended enterprise comprising of the strategic supplier as well.

In 2007 (after the research period) the plan was to extend the KM programme toward the customers as well. In this year, five years after the commencement of the implementation of the programme, the intention has also been to introduce a new term and label people participating actively in the programme as 'associates'. The hope is that employees who would initiate KM activities on their own would be gratified by this¹.

4.4.4.2 Methodologies usage

Operating to specified KM standards hasn't reached yet the status of being requested by external customers (as it is for quality standards, such as ISO9001, or CMMI (Dayan and Evans, 2006)). When it is, life will be much easier for knowledge managers, because they will have a very tangible reason to promote the requirements and procedures. The director of knowledge has therefore used six basic methods to implement and publicize the programme (presented as one of the factors related to the director of knowledge in appendix 5):

- Communication:

The programme has been communicated continuously at all levels – management regular and dedicated meetings, management courses, any gathering dedicated to the change process, and all occasions for any organization to meet on a general subject. KM is publicized as well on the IAI-Net with a homepage representing all four phases of the programme, success stories from around the company, examples from around the world, and an area dedicated to the knowledge managers where measures and results are published.

- The KM handbook:

KM could be interpreted in many ways by different people. IAI has been operating for over fifty years now, and proposing in the year 2001 the management of its knowledge is probably presumptuous. To take care of this possible pluralism of approaches that would disable any industrial implementation, a knowledge management handbook was written and published within IAI. Its purpose has been to commonly answer across IAI questions as to why, what, by whom, how and when anything needs to be done to support the full life cycle of knowledge management. Each and every procedure is described in details while the handbook as a whole gives a complete picture of the programme to enhance its comprehensive nature. For each procedure, the following sections have been included:

- Introduction and definition of terms
- The requirement
- Purpose and goals
- Procedure description
- Technology and other backing resources
- Organization
- Measurements
- Training content

- Evaluation, measurement, and publicity:

¹ Compare with Hubert Saint-Onge's approach in section 3.3.3.3

KM implementation is evaluated and measured through two different processes. The division sets to itself targets on the PDM, and these are monitored and published on the IAI-Net, as well their attainment. Moreover, the maturity in implementing the programme is self and mutual assessed along the year, and the results are also published.

This creates competition as well as enables the knowledge managers to take example from one another.

- Corporate involvement:

Corporate is involved in the programme in numerous ways. The programme is being reviewed at the T50 level at least once a year; KM assessment results are contributing to the division's grade to compete for the national excellence prize; T50 members are voluntarily acting as sponsors of communities of practice¹; and the VP for R&D and strategy is reviewing the KM plans of all divisions twice a year. The relative direct access that the director of knowledge has with all levels of IAI management is undeniably helping the implementation of the programme.

- PDM as a management tool:

The PDM tool for the management of KM in IAI has been modified to incorporate a notion of adaptive flexibility (detailed in the next section). The list of procedures from which to choose is fixed, yet the knowledge manager needs to choose only four out of 12 depending on the needs of the organization; the list of measures from which to choose is fixed, yet there are a few measures to choose from for each level (performance, throughput and result); the actions are totally left for the division to decide (see appendix 6 for a picture of the PDM).

- National and international exposure:

The IAI-KM programme is being presented at least once a year on international stages and on numerous occasions to national conventions on knowledge management. The method of managing the programme using the PDM (Hoshin Kanri) model is of special interest and has already been twice the subject of dedicated international workshops. This is creating encouragement to the knowledge managers and pride to the company.

4.5 The Hoshin Kanri tool for KM management in IAI

The process used by IAI for the implementation of its change programme is based on the Hoshin Kanri process (Kondo, 1998). Hoshin Kanri is a Japanese technique for deploying company strategy down to an individual's annual objectives. Thus a logical link is made between the CEO's intent and the individual daily actions. Hoshin Kanri can be literally translated as policy management, but in the anglicised word, 'management' has become 'deployment' (Palmer, A., 2004). The Hoshin Kanri process is first, a systematic planning methodology for defining long-range key entity objectives. These breakthrough objectives typically extend two to five years with little change. Second, the Hoshin Kanri process does not lose sight of the day-to-day 'business fundamental' measures required to run the business successfully. This two-pronged approach provides an extended period for the

¹ The CEO has taken sponsorship for the nano-technology community of practice.

organization to focus its breakthrough effort while continuously improving key business processes day to day.

4.5.1 Literature review on Hoshin Kanri

The origin of the Hoshin Kanri method is from Japan in the mid-sixties. Some attribute it to the Bridgestone Tire Company, Japan which won the Demming Application Prize in 1968 (Miyaji, 1969 cited in Kondo, 1998). Others, attribute it to Komatsu¹ which in 1965 intended to speed the transition from statistical process control to total quality control, latter to be improved in the 1970s by the Tamagawa University in Japan, who introduced the target/means matrix as a way of clarifying measures, control items and control points (Tennant and Roberts, 2000). The literal definitions are Hoshin (shining metal) and Kanri (pointing direction), but what it really means is a unique intention to improve consistency between strategic goals and the daily activities of the business. The first authoritative text in English on the subject was edited by Yoji Akao in 1991 who described it as "a planning, implementation and review system for managed change²" (Akao, 1991 cited in Hunt and Xavier, 2003), or as "the means by which both the overall control system and TQM are deployed" (Akao, 1991 cited in Tennant and Roberts, 2000). The challenge for companies is to identify an appropriate technique, which upon implementation will cohesively integrate the vision and major goals, without alienating other strategies. The quality strategy in particular, can get left behind as an alternative strategy, which could be perceived to be secondary to the harsh realities of short-term profits, productivity and cost reduction actions. The approach advocated by Hoshin Kanri applies to companies who know³ what their customers will want in five to ten years and understand what needs to be done to meet and exceed all expectations. Planning and deployment are critical elements of Hoshin Kanri, which imply that the process of developing targets, the development of means to achieve the targets and the deployment of both are crucial to the successful adoption of Hoshin Kanri (Tennant and Roberts, 2001a). This requires:

- A planning system that has integrated Demming's 'Plan-Do-Check-Act' language and activity based on a clear long-term thinking.
- Planning should be integrated with daily activity underpinned by good vertical and cross functional communication, to allow a continual checking of target and means throughout the implementation timescale.
- Everyone in the organization should be involved with the planning and goal setting process at local levels to ensure a significant buy-in to the overall process, and appropriate levels for goals and targets (Tennant and Roberts, 2001b). A key factor is organization-wide transparency; when employees understand corporate purpose they can then control their own performances in relation to it, self-manage their own work, and act to correct divergences from corporate goals (Bartlett and Ghoshal, 1994 cited in Witcher and Butterworth, 2001).

¹ A Japanese construction equipment company.

² This definition is the closest to the application of Hoshin Kanri at IAI.

³ The author is reserved about this requirement and would suffice with companies who think they know what their customers will want in five to ten years.

- Groups should be aligned with decisions taken by people who have the necessary information.
- The measurement system needs to be realistic with a focus on process and results and identification of what's important.

Kondo (1998) describes Hoshin Kanri as a system of management in which the annual policy set by a company is passed down through the organization and implemented across all departments and functions in this system. It is a prerequisite to determine and communicate a company vision and strategy, prior to delving into the details of the technique.

The process starts with the top management of the company setting up its basic philosophy and policy. This is then detailed as a medium to long term policy. A company's annual policy cannot be determined only by short term considerations, such as review of the previous year's results or the company's prediction and aspirations for the coming year and it must be guided by its long term policy. The further ahead one looks, the less accurate the predictions are likely to be; however, the effort to link the policy for each year to the firm's medium to long term policy can be viewed as a kind of training for widening the firm's perspective and sharpening its ability to forecast the future. These policies consist then of aims to which targets are set. Targets have a final value, one which the firm needs to achieve. These should be breakthrough yet realistic targets so that they can create motivation. Nevertheless, intermediate targets would also have to be set so that the process can be managed and controlled.

Tennant and Roberts (2000) relate the Hoshin Kanri method to the implementation of quality and claim it has tended to focus on Japanese companies, with a handful of practitioners in the USA¹, and with very little evidence of application within the European business community². Their research deals with its application with the Rover Group in the UK. They view the failure of TQM in Western industries, "in part due to a lack of holistic awareness of the essential elements of strategy formulation and in particular the ability to integrate company strategy with the TQM programme. Strategy requires the essential elements of integrating the major goals, policies and tactics into a cohesive whole. A well-formulated strategy must allocate the available resources into a unique and viable posture based on relative internal competencies, shortcomings and anticipated changes in environment". This is what Hoshin Kanri tries to implement and this is why it is sometimes translated as 'target and means management' (Tennant and Roberts, 2000). As opposed to the approach of 'management by objectives'⁶⁵, in Hoshin Kanri results are measured through processes rather than targets (see table 4-1 for a comparison of planning between Hoshin Kanri, Management by Objectives (MBO), and Business Process Reengineering (BPR)).

Hoshin Kanri proved extremely effective in (Tennant and Roberts, 2000):

- Integrating strategic objectives with tactical daily management.
- Applying the plan-do-check-act cycle to business process management.

¹ These include NovAtel, Xerox (Witcher and Butterworth, 1999), Hewlett-Packard (Witcher and Butterworth, 2000), Texas Instruments, Proctor & Gamble, Florida Power and Light, and Intel.

² Nissan Europe is an example of application (Palmer, A., 2004)

- Converting mandatory objectives set by senior management into employees' own self-set targets.
- Furthering company-wide improvement plans by uniting the efforts of all employees.
- Improving communication.
- Motivating employees.

Element	Hoshin Kanri	MBO	BPR
Vision	Long term	Short term	Radical
Focus	Processes	Targets	Performance
Implementation	Prioritize	Troubleshoot	Make it work
Measures	Realistic	Incentives	Growth
Review	Improvement	Failure	Renewal
Communication	Deployment of targets	Job-evaluation	Tangible messages
Feedback	Top-down and bottom-up	Top-down	Multiple channels

Table 4-1: Comparison of planning for different business process management systems

4.5.2 Hoshin Kanri implementation

Hoshin Kanri ensures that everyone in the organization is working toward the same end. This was crucial to IAI who has been very fragmented between all its groups and divisions because of its policy of decentralization, and especially ever since the Lavi programme cancellation. The plan is hierarchical, cascading down through the organization and to key business-process owners. Ownership of the supporting strategies is clearly identified with measures at the appropriate level or process owner within the organization.

In the Hoshin Kanri process, strategic planning is systematized: The format of the plans is unified via standards. The standardization provides a structured approach for developing and producing the organization's strategic plan. The structure and standards also enable an efficient linkage of the strategic plan through the organization. This ultimately leads to an organization-wide understanding of not just the plan but also the planning process. Hoshin Kanri transmits across the organization a common message of KM performance being monitored through common measures, those affected by locally designed actions.

The hierarchical linkage attribute of the Hoshin Kanri plan occurs because of the pass-down process of the plans at each succeeding level. PDM1 is the plan at the CEO level and it reflects the objectives of the company as a whole. PDM2 consists of the objectives of the group, is dependent on PDM1 but by its achievements actually edicts it. The same happens with PDM3 which is the division's PDM. PDM4 is the level for directorates. Level 4 has also been chosen for lateral operations affecting the division and that are managed centrally. Such is the KM-PDM (appendix 6) which is meant to support the division's objectives and affects its results. The hierarchical linkage attribute of the Hoshin Kanri plan reflects the pass-down process of the plans at each succeeding level. This is the cascading attribute of the Hoshin Kanri planning process that helps in empowering the organization. As

each succeeding level accepts its portion of the plan, it has been involved in the plan's development by adding detail where it can best contribute and add value. This is also how the organization buys into the plan; it now has some ownership of the plan itself. The Hoshin Kanri methodology is a strategic planning process with the built-in ability to empower the organization.

4.5.2.1 Objectives

The long-range key entity objectives of the KM-PDM are the KM procedures chosen with two considerations in mind:

- To support the needs of the higher level PDM (the division's PDM).
- To enhance the performance of knowledge management as prescribed by the KM programme (to perform in all four phases of the KM life cycle).

Sometime toward the middle of the fourth quarter of the year, when the division is assessing its yearly accomplishments and when the next year objectives start to be articulated, is the time for the knowledge manager to propose from his KM procedures tool box, the ways to support the division. This starts the active planning of the next year's KM programme. To the four procedures coming from the life cycle of knowledge management, the division adds a fifth dealing with the performance of the programme itself, its publication, the level of awareness to it and the proficiency performers have in implementing it.

KM objectives are set for the whole year but in determining them, the knowledge manager takes into consideration beyond the two above rationales, also the status of accomplishment in KM activity from the preceding year and the capability as it showed in the last mutual assessment score.

4.5.2.2 Measures

"When you can measure what you are speaking about and express it in numbers, you know something about it. Otherwise, your knowledge is a meagre and unsatisfactory kind; it may be the beginning of knowledge but you have scarcely in thought advanced to the stage of science" (Lord Kelvin, 1824-1904, quoted in (Pervaiz et al, 1999)).

Measures are the way one can assess achieving a set objective. This research deals with the measurement of knowledge management¹, rather than with the measurement of knowledge itself. The objectives are the performance of the KM procedures and they are measured (performance measures), their output (throughput measures), and their operational or business affect (result measures):

- Performance measure: Measuring the action itself, its extent, and its scope (for example in a community of practice, it would include the number of people joining the community, the frequency of their

¹ To be compared with the description of KM measurement in the literature presented in section 3.5.

meetings, the members' attendance, and the amount of knowledge shared).

- Throughput measure: Measuring the throughput that is directly related to the action itself (for example in a community of practice, it would include the achievements of the goals self determined by the community, or the generation of best practices).
- Result measure: The aim is for a relationship between actual business results and knowledge management activity. Measuring the results that are directly or indirectly accountable to throughputs of the action is a result measure.

Measures have to be attributed with targets that must be realistic yet challenging ('stretch goals'). Achieving targets tells the knowledge manager that the division is effectively acting on the objectives and since these were chosen to benefit the division's operational goals then there is a better chance of approaching them. The higher the level of the measure, the more effective the implementation of KM is in benefiting the division.

Appendix 6 shows a picture of the KM-PDM and in it, the matching matrix between the measures and the procedures (the objectives). The aim is that each and every procedure should be measured by at least one measure.

4.5.2.3 Actions

Actions are meant to close the open gap between the existing value of the measure and its target. Actions are attributed to the various knowledge leaders and to the directorates they belong to.

Appendix 6 shows the matching matrix between the actions and the measures. The aim of course is that each and every measure should be affected by at least one action.

4.5.2.4 Division directorates' participation

The KM-PDM in appendix 6 also shows the matching matrix between the actions and the participating directorates' knowledge leaders. The aim of course is that each and every action should be executed by at least one knowledge leader so that all directorates participate in the program implementation.

4.6 The self and mutual assessment tool

4.6.1 Literature review on self assessment

Adoption of the Malcolm Baldrige National Quality Award (MBNQA) (Malcolm Baldrige National Quality Award (MBNQA), 2001) and European Foundation for Quality Management (EFQM) (European Foundation for Quality Management (EFQM),) business excellence frameworks by Western businesses, has encouraged the application of 'self-assessment' as an alternative to the more traditional methods of auditing business performance. It is generally acknowledged that self-assessment focuses on continuous improvement through organizational learning, whereas the more conventional audit and review approach does not (Tennant and Roberts, 2003). Self-

assessment is aimed at providing organizations with a systematic and regular measurement system leading to the implementation of planned actions. The self-assessment should be primarily concerned with ensuring that any approaches incorporate high levels of quality practice aimed at achieving excellence which can be summarized as follows:

- Systematic: well thought through, competently applied and demonstrably fit for purpose.
- Prevention-based: geared to preventing failures rather than to detecting them after the event.
- Subject to regular reviews: with the emphasis on driving continuous improvement activity.
- Integrated: into the mainstream operations and planning processes of the company.
- Refinement cycles: which are deliberate and planned driven by data gathered from reviews.

Scoring guidelines are stated against the enablers and results at five cumulatively growing levels. Detailed questions for the self-assessment process would then be worded based on the defined procedures and best practices for QM implementation. The self-assessment process commences with a presentation to the project team explaining the rationale for the movement from project review to self-assessment; it then goes to brainstorming strengths and weaknesses with both the process definition as well as implementation; then qualitative and quantitative assessments are carried out against all the criteria questions. Evidence of real deployment leading to the achievements of effective results must be provided. Scoring is being agreed to in consensus by the assessment team and a series of appropriate improvement actions is generated.

Stages of growth models have been used widely in organizational and management research. These models describe a wide variety of phenomena, inclusive of the organizational life cycle, the product life cycle, etc. These models assume that predictable patterns, conceptualized in terms of stages, exist in the growth of organizations, or in the sales levels of products. These stages are sequential in nature, they occur as a hierarchical progression that is not easily reversed, and involve a broad range of organizational activities and structures (Gottschalk and Khandelwal, 2004). The tendency in this type of assessment is to concentrate on weaknesses rather than strengths, unless if the organization is participating in assessment in order to win an award (Armistead, Pritchard, and Machin, 1999). Various multistage models have been proposed for organizational evolution over time.

In the area of knowledge management, a five stage maturity model has been used to assess the relative maturity of a company's knowledge management efforts (Housel and Bell, 2001 cited in Gottschalk and Khandelwal, 2004p.136):

- Level 1 – The default stage in which there is low commitment to managing anything other than essential, necessary survival tasks. Formal training is the main mechanism for learning which is all reactive. Organizations fragment knowledge into isolated pockets that are not explicitly documented.

- Level 2 - Only routine and procedural knowledge. Need-to-know is characteristic, and knowledge awareness rises with the realization that knowledge is an important organizational resource that must be managed explicitly. Databases and routine tasks exist but are not centrally compiled or managed.
- Level three - Organizations are aware of the need for managing knowledge. Content fit for use in all functions begins to be organized into a knowledge life cycle, and enterprise knowledge-propagation systems are in place. However, general awareness and maintenance are limited.
- Level four - Characterized by enterprise knowledge sharing systems. These systems respond proactively to the environment and the quality, currency, utility, and usage of these systems is improved. Knowledge processes are sealed up across the organization, and organization knowledge boundaries become blurred. Benefits of knowledge sharing and reuse can be explicitly quantified, and training moves into an ad-hoc basis as the technology infrastructure for knowledge sharing is increasingly integrated and seamless.
- Level five - Knowledge sharing is institutionalized and organizational boundaries are minimized. Human know-how and content expertise are integrated into a seamless package, and knowledge can be most effectively leveraged. Organizations have the ability to accelerate the knowledge life cycle to achieve business advantage.

This model uses Guttman scaling which is a cumulative scaling technique based on ordering theory that suggests a linear relationship between the elements of a domain and the items on a test (Guttman, 1950 cited in Gottschalk and Khandelwal, 2004). Applying Guttman scaling enables relying on a positive assessment at any stage to infer a similar situation for all previous stages. For example, a cumulative model for knowledge transfer could consist of six stages: awareness, familiarity, attempt to use, utilization, results, and impact. Guttman scaling has been criticized for three reasons: The underlying measurement model that could sometimes not fit what is being measured¹; the requirement for unidimensionality of the scale which may not be achievable; and the necessity for ordinal measurement which could restrict some statistical analysis (Kline, 1998, p.75 cited in Gottschalk and Khandelwal, 2004p.113).

4.6.2 Self assessment implementation

IAI is using a method of self-assessment for the testing of the maturity of implementation of various processes across the company. The knowledge management implementation is self-assessed as well. The method² is based on the well established capability maturity matrix (CMM) that grades in five levels the depth to which an organization has arrived in the implementation of a given process:

- Awareness

¹ Critical comments of this type were mentioned toward the self assessment matrix for KM implementation at IAI by divisions not achieving scores as they expected.

² Comparable to the method reported in (Housel and Bell, 2001 cited in Gottschalk and Khandelwal, 2004p.136) described in section 4.6.1.

- Training
- Understanding
- Commitment
- Habit

A committee internal to the division and appointed by its GM assesses the level achieved in the implementation of KM in the division on a quarterly basis. This is done using a detailed set of questions about every aspect of the programme (detailed in appendix 7).

The questions seek an appraisal of the locality of the implementation, as opposed to the measure of its being universal, the measure of its throughput and the perception of any effect it may have on the operational and business results. Another issue being assessed, is the source of initiative to the programme – does it stay at corporate level or does it go down to the division, to the directorate or maybe even to the personal level. The levelled approach to assessing the maturity of the assimilation of a process is a matter of essence. The mere awareness of 'what is done in this process' can not be but the very beginning of the implementation. The next stage is the training one in which the details of 'what is done' are now being trained and implemented, creating a common language. Only when you understand a process, you can fully implement it, not only literally, but also in spirit. Then comes the commitment phase and only later the process implementation becomes a habit and is not considered peculiar anymore.

The self assessment is moderated on a yearly basis by a team external to the division that includes IAI's director of knowledge, a knowledge manager from another division and one from the corporate organizations; the mutual assessment process takes a full day spent at the premises of the division examined; at the end, the results are negotiated with the division's management to reach a consensus. The management purpose is to learn from the assessment in order to correct its implementation method and improve its results. The mutual-assessment results are also published on the IAI-Net and are another source of internal competition within the company to give it a catching effect.

The questions asked are grouped according to the phases in the knowledge management cycle, and in addition, questions pertaining the programme management and implementation:

4.6.2.1 Programme management and implementation

The matrix includes three questions assessing the establishment of a knowledge organization, of the being of the programme on the division's agenda, and on its communication across the division.

4.6.2.2 Knowledge capture and documentation

There are two questions assessing the process of capturing critical tacit knowledge and of gathering knowledge from lessons learned.

4.6.2.3 Knowledge retrieval for reuse

Three questions assess the management of the competence centres' knowledge, of the technological and business data bases, and of the processes for inducing the retrieval and reuse of knowledge.

4.6.2.4 New knowledge creation

There are two questions to assess the management of the knowledge created along the project development, and upon innovation processes or the importing of new knowledge to the division.

4.6.2.5 Knowledge sharing

Three questions assess the involvement of the division in the establishment and leadership of communities of practice, the awareness for good practices and their publication, and the attentiveness to the quality of the division's site on the IAI-Net as a sharing knowledge instrument.

4.7 Chapter overview

The study deals with the implementation of knowledge management as a change programme in a large corporation. The research has been performed in Israel Aircraft Industries by its director of knowledge. IAI itself has been briefly described as well as the overall change programme that has preceded the implementation of the knowledge management programme and has paved the way for it. The author hopes that by this, the complexity of the environment will be better appreciated.

The initiation of the KM programme has been described as a background for the presentation of the two pillars of its establishment:

- Its comprehensiveness represented by the circular shape of its life cycle.
- Its relationship with the organization's operational and business results, represented by the usage of related measures for its management.

The four phases in the life cycle of knowledge management have been described as well as its twelve procedures which should be considered as the flexibility dimension of applying KM along its full cycle life. The main participants in the programme implementation have been presented as well as the dynamic interaction between them in preparation for a factorial analysis of their inter-relationship to be exposed in chapter 6.

The implementation plan was presented in its long and short term contexts, also assisting the reader to gain a better perspective of the programme from the point of view of the director of knowledge.

The programme has been managed using the Hoshin Kanri policy deployment model and monitored for the maturity of its implementation using self and mutual assessments. These have been described and explained in details while their content appears in appendices.

5 Collecting the Evidence

"It is a capital mistake to theorise before one has data" (Arthur Conan Doyle)

Being the director of knowledge of the company, the researcher had excellent access to the divisions, to their personnel and management and to the data representing their KM performance. Data has been collected along the years of implementation of the programme at all 23 divisions and it included planning information, intentions at the start of each planning year, measures, targets, and accomplishment along the year, description of actions meant to achieve those targets, and distribution of those actions among the division's personnel and specifically the knowledge manager and the knowledge leaders.

For the purpose of this study the author limited the data to the one originating from five selected divisions to represent the case studies to be investigated (the choice process of these divisions is described in the next section).

The author added to this data, information coming from a questionnaire distributed to all division general managers and knowledge managers and he also conducted interviews to moderate and refine the information derived from the questionnaires.

5.1 Choice of divisions as case studies

In cases where data is typically non-numerical and could be affecting the design along with its collection, where the focus of the study is on processes and where direct involvement of the researcher will inevitably initiate change, qualitative research is appropriate (further explained in chapter 2). Case studies are considered as the preferred method when 'how' and 'why' questions are being posed, when the researcher has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. This is because such questions deal with operational links needing to be traced over time, rather than with mere frequencies or incidence. The author has elaborated the rationale for choosing a multiple case study for the research. The challenge was to choose those divisions.

There are 23 divisions in IAI, organized in five groups and including three divisions at the corporate level. The original intention was to include as case studies, a division from each group and one at the corporate level. Unfortunately, the author couldn't consider divisions that practically haven't been active in the KM implementation, or from which no questionnaire response was received. The analysis has been mainly built on performance as reflected from the PDM or the mutual assessment, and this being deficient, one would have had an inadequate basis for analysis. The deficiency was concentrated in the divisions of one of the groups that either weren't active in the implementation, or haven't been supplying proper information (as questionnaires answered by the GM but not by the knowledge manager and vice-versa), so though they have been included in the data gathered, the author hasn't been able to pick one of them as a case study. The choice in any case has been a mix of successful divisions and less successful ones as it can be seen from appendix 9. One can see that the five picked divisions are located in

the two middle quarters of the distribution of results for the 2004 mutual assessment. The lower quarter was problematic because it included only two divisions for which there were filled questionnaires but in one of them the GM was replaced during the evaluation period, and in the other it was the knowledge manager who was replaced.

Table 5-1 shows the chosen division and their mutual assessment (M/A) scores:

Division	M/A 2003	M/A 2004
A	0.71	1.47
S	0.3	1.3
N	0.66	0.93
J	0.49	0.87
U	0.54	0.7

Table 5-1: Divisions chosen as case studies

To put these scores in perspective, one should note that the highest and lowest score for 2004 for participating divisions was respectively 1.97 and 0.23 while for 2003 these were 0.72 and 0.11.

5.2 Operationalizing success

Success is the ability to go from failure to failure without losing your enthusiasm. (Winston Churchill)

The Merriam-Webster dictionary defines success as "a favourable or desired outcome", but also as "the attainment of wealth, favour, or eminence". Its thesaurus renders "a person or thing that is successful", or "a successful result brought about by hard work". The Web definition through 'Ask Jeeves' was a lot simpler and more straightforward: "an event that accomplishes its intended purpose". In any case, success has to be seen as being related to its context, and sometimes valuable mainly if there has been a significant investment (hard work), with a purpose in mind. This has been illustrated in a research of the University of Colorado about the definition of success for an engineering student (Piket-May, Chang, and Avery, 1998). The notion on which the research is based is that 'the key to success is the ability to accurately perceive what is required in a given environment'. Would the definition of success be given by grade schools based on their perception of what is required of an engineer? Would it be based on the perceptions of the students themselves? Should the industrial perception of a successful engineer prevail? Or maybe, the universities would define success as a higher percentage of engineers staying in for research and not pursuing an industrial career?

The purpose for the implementation of knowledge management has been stated as being the enhancement of the firm's competitive advantage and the achievement of its operational and business goals. The event accomplishing the intended purpose is therefore the *successful* implementation of the programme. The researcher has therefore regarded success for the purpose of this research as a variable, a dependent variable, to be described as dependent on the way

the programme is performed as well as on additional factors (to be detailed in chapter 6).

5.2.1 Programme success and not business success

The research question inquires for factors in the implementation of a *sustainable* knowledge management programme. By factors, one means success factors of course. The very usage of the term sustainable implies that the effort hasn't only been initiated, tried, ventured, but it has also sustained the competition in management attention and in all the other scarce resources in which corporations operate.

Linder and Peters (1987) have looked at the implementation of public policy and have analysed what could be considered as a successful implementation (Linder and Peters, 1987). They have compared two analytical conventions that could have an impact on the significance of the terms implementation and success. One is termed 'selective relativism'¹ and the other 'limited contingency'. Both reduce the task of the investigator to manageable proportions by sacrificing portions of reality. The result is a partial view of implementation phenomena shaped, often admittedly, by the investigators' values. In fact, most systematic social inquiry springs from a particular vantage point assumed by the investigator. A portion of the phenomena of interest is certain to fall outside the investigator's field of vision; part will be obscured by poor visibility and part simply by lack of recognition. Moreover, in the course of viewing, meanings will be assigned and interpretation made. What's more interesting is not what the investigator sees, but how he sees it. Certain phenomena maybe taken as objective and existing independently of anyone viewer, while others appear subjective and depend for their meaning on the eyes of the beholder. Besides selecting a vantage point, the investigator also brings along a *de facto* boundary dividing phenomena into objective and subjective chunks. In this context, relativism refers to the magnitude of the subjective chunk. It is selective in the sense of being inherently less than the whole. This relativism actually provides the groundwork for the application of limited contingency. Treating organizations as relative implies that their responses may vary depending upon a wide range of social contingencies. The meanings assigned to organizational phenomena, as a consequence, will always be relative ones, attached to some set of contingencies largely external to the organization.

While selective relativism applies to the meaning and the interpretation of terms, limited contingency refers to the nature of the posited relationships and their role in explanation. The implementors are assumed to operate on the product of formulation, adding something here and changing something there. The eventually resulting programme is thought to represent a compromise or balance between the formulator's intentions and the implementor's routines. Effective implementation, then, is an outcome based on a 'recipe' containing the

¹ Relativism maintains that there is no reality independent of human consciousness; there are only different sets of meanings and classifications which people attach to the world. 'Reality' can be constructed only by means of a conceptual system, and hence there can be no objective reality because different cultures and societies have different conceptual systems.

proper alignment of factors; the decisive factors must be present at the same time, in the proper magnitude, in order for the recipe to work.

This discussion on relativism and contingency has a great deal of relevance for how success is determined in implementation. Programmes are said to be successful if they 'work', although the meaning of the term 'work' is rarely specified. This approach to success clearly falls into the limited contingency characterization of implementation research. Things would be successful if they would meet certain apparent patterns of fit. This fit, however relies very much on the subjective evaluation of the individual researcher rather than on specified criteria. Frequently, and as it is in the case the author has been dealing with, organizational success is defined in terms of performance of the programme as prescribed rather than in terms of outputs and results.

5.2.2 Success as a variable – a working definition

Success in this research comprises of the following components:

- Performance of the programme as required and as represented by the PDM (as explained in section 4.5).
- Achievement of maturity levels as judged by the mutual assessment process.

Using the knowledge management handbook as a reference, each portion of the PDM has been compared with its requirement and graded accordingly as successful or not as described in chapter 4 (see also appendix 6). The knowledge managers are using the PDM as a planning tool as well as a management instrument for the KM programme. Planning would be considered successful if done according to the handbook specifications (one procedure per phase in the KM life cycle; measures and targets for all procedures; at least one throughput or business result measure; actions to affect measures; and a distribution of the programme implementation across the division). Performance would be considered successful if measures reach the planned targets.

Mutual assessment scores have been given as described in chapter 4 on a yearly basis. The knowledge managers are conducting a self assessment of the implementation of the programme on a quarterly basis. The comparison of these scores to the yearly mutual assessment one is considered as a component of the measure for success in addition to the scores themselves. The knowledge managers are expected to be realistic enough and to assess themselves within +/- 20% of the mutual assessment score.

Both PDM and mutual assessment scores will be considered for the success analysis of the division as described in chapter 7.

As stated, successful implementation implies it being sustainable. The overall improvement in scores along the two years of evaluation (211% on the average), is a sign of sustainability in general (only division P displayed regression in performance as one can see in appendix 9).

One should note that since implementing KM can only progress, a successful score can promote it while an unsuccessful one wouldn't diminish the level of implementation but only delay it. Hence, the treatment of success is time related – 2004 scores compared to 2003 ones. Nevertheless, negative scores

in 2003 (as related to the KM handbook), can signal a year of stagnation in KM implementation.

5.3 What in the PDM is considered as success

5.3.1 Objectives

Procedures are chosen by the knowledge manager with purpose in mind to support the division's yearly agenda. Divisions are expected to choose at least one procedure per phase in the KM life cycle (see chapter 4 for the list of procedures). By this, they show attendance to all phases of the cycle. Most divisions actually didn't choose more than one.

The quality of choice of procedures is not being graded, assuming that the process guided by the knowledge manager, accompanied by the knowledge leaders and approved by the GM would render the best set for the division, and that there wouldn't be any outside function who would be able to suggest otherwise. Nevertheless, the PDM is commented by the director of knowledge when proposed by the division, and if a choice of procedure is questionable, it would be returned with remarks.

Hence, a successful score means a full choice of procedures.

5.3.2 Measures

Measures at their three levels (performance, throughput and result), are related to procedures by the KM handbook. The knowledge manager, together with the knowledge leaders and particularly in concurrence with the one who is going to lead the action for it in the division, are choosing the measures. Measures always fully match the procedures dictating them. Moreover, sometimes, a measure will partially match an additional procedure and supply information about its performance. This is being marked in the Goal/Measure Matching section of the PDM (in appendix 6).

Divisions are required to choose at least one measure as a throughput or result measure. The choice of measures is also influenced by the recurrence of choice for the same procedure year after year. In such a case, the division is to choose an upgraded measure on the following year (throughput instead of performance and result instead of throughput).

Each measure is appropriated with two values – one being the basis which was describing the situation for this measure at the beginning of the year, and the other, being the target the division is aiming for at the end of the year.

The measure section for the PDM is considered successful if it matches all of the above.

5.3.3 Actions

Actions are chosen by the knowledge manager accompanied by the knowledge leaders and particularly in concurrence with the one who is going to lead it in the division.

Actions' purpose is to close the gap existing between the basis value of the measure and the target for it. Actions should therefore have a clear relevance to measures. This relevance is described in the Action/Measure Matching

section of the PDM. Again, actions would fully match the measure it was chosen to affect, though sometimes it would partially match additional measures.

The action section for the PDM is considered successful if it matches all of the above.

5.3.4 Division involvement

The KM yearly programme as depicted by the PDM is a division affair. It can't be conceived, planned, and performed by the knowledge manager alone. Even if this would be feasible, it wouldn't be wise because KM is a value that has to penetrate to all levels of the division. This is done by nominating a representative of each of the division's directorates as knowledge leader for the directorate and involving him in the process.

Actions are performed across the division but are led by different knowledge leaders, according to the fitness between the action and the directorate's agenda.

The involvement section for the PDM is considered successful if it matches the above.

5.4 What in the mutual assessment data is considered as success

Divisions are self assessing their level of implementation of the KM programme on a quarterly basis. Toward the beginning of the year, and prior to the performance of the mutual assessment, the latest self assessment scores are published by the divisions' knowledge managers.

The questions in the assessment matrix¹ are grouped according to the assessment level (as described in chapter 4), and to the phases in the life cycle of the KM programme. The knowledge manager is required to show evidence to claims he is making upon the division's performance of the KM programme. For a list of the issues inquired at the specific level for the particular KM phase see appendix 7.

The highest the score of the mutual assessment the more successful is the division considered. The scores compare with the other divisions and also with the one of the preceding year. The scores are built using the Guttman scaling which is a cumulative scaling technique described in section 4.6.1, but include a separate score for each of the KM programme phases as one can see in appendix 9.

¹ Comparable to to the method reported in (Housel and Bell, 2001 cited in Gottschalk and Khandelwal, 2004p.136) described in section 4.6.1.

5.5 Using questionnaires to gather participants position

5.5.1 The design of the questionnaires

A causal structure was established for the questionnaires. The questions in it were distributed dividing them first by the four basic questions related to the KM implementation and then by a set of subcategories:

- Why are you performing KM?
- What are you doing on behalf of KM performance?
- How are you performing KM?
- When are you performing KM?

All the questions were closed questions and respondents were given a choice of 5 answers in a Likert scale¹:

- 1- Very much,
- 2- Yes,
- 3- Partially,
- 4- No,
- 5- Not applicable

Worrying more about the clarity of the message transmitted through the questions than about their wording the author ended up with quite a few questions which were longer than they should have been (Do you consider KM aligned with business strategies (such as developing intellectual asset tactics and strategy to support business strategy, relate intellectual property to business use, focusing the KM vision and practice to support and align with enterprise strategy and direction, embedding KM in the business model)?), or even questions with multiple content (Do you see a role to the knowledge managers or leaders in a case of emergency (or do you consider their task too remote and long term)?).

The author was inspired by the success factors for the implementation of knowledge management (discussed in section 6.1.2) when designing the questionnaire but also by various sources for the design of questionnaires. Two of the main ones, follow:

5.5.1.1 The MAKE survey

The Global Most Admired Knowledge Enterprises (MAKE) research programme was established in 1998 to recognize organizations for their ability to leverage new as well as existing enterprise knowledge to deliver superior performance in the areas of organizational creativity, operational effectiveness and excellence in products and services. The Global MAKE research is based on the Delphi methodology. This technique uses an expert panel's perceptual knowledge to identify critical issues – in the case of the Global MAKE study, to identify those organizations which are leaders in the new knowledge economy. A consensus is developed among the panel's

¹ Rensis Likert is responsible for popularizing the response scale that carries his name where, in a numerical range (typically from 1 to 5) a respondent is asked to select one ('interval') response such as 'completely agree', 'agree', 'no opinion', 'disagree', 'completely disagree', and so on.

experts through several iterations. It is this consensus of expert opinion which provides the validity to the Delphi and Global MAKE study results. The Global MAKE Winners are chosen by an international panel of Fortune global 500 senior executives and leading knowledge management experts. In the Global MAKE study there are three rounds of consensus building. In the first round, members of the expert panel identify possible Global MAKE enterprises. In the second round, each member of the expert panel selects a maximum of three organizations from the list of nominations. Those organizations selected by at least 10% of the expert panel are recognized as Global MAKE Finalists. In the third and final round, the Global MAKE Finalists are measured against each of the eight knowledge performance dimensions which are the visible drivers of competitive advantage (those dimensions have been used among others for the design of the questionnaire):

- Creating a corporate knowledge culture.
- Developing knowledge leaders.
- Delivering knowledge-based products/services/solutions.
- Maximizing enterprise intellectual capital.
- Creating an environment for collaborative knowledge sharing.
- Creating a learning organization.
- Focusing on customer knowledge.
- Transforming knowledge into shareholder value.

The top 20 Global MAKE Finalists by total composite score are recognized as Global MAKE Winners (Chase,).

5.5.1.2 The Kentucky University survey

The University of Kentucky conducted a survey on activities (listed in appendix 1), related to knowledge management and their impacts on competitiveness (Holsapple and Jones, 2004a). The author has utilized some of the concepts to word specific questions as:

- Knowledge acquisition (this refers to the activity that begins with identifying knowledge in the organization's external environment and concludes with transforming it into a representation that can be employed by the selected organization):
 - Soliciting knowledge from external sources (such as advice/perceptions from consultants, customers, suppliers, and survey participants).
 - Participating in collaborative acquisition (such as communities of practice).
- Knowledge selection (selecting knowledge refers to the activity of identifying needed knowledge within the selected organization's existing knowledge resources and providing it in an appropriate representation to an activity that needs it:
 - Recalling from a technological repository (such as organizational memory system, archived e-mail, or database).
 - Recalling from a non-technological repository (such as policy manuals, videos, audio, and company documents).

- Seeking out people's know-how, know-what and know-why (such as using people networks to effectively share knowledge, interviewing, extracting, eliciting, querying, engaging participation).
- Knowledge generation (generation is an activity that produces knowledge by discovering or deriving it from existing knowledge):
 - Mining (such as analyzing patterns in data/text).
 - Learning lessons, sense-making (making sense out of organizational and environmental factors in order to adequately make decisions).
 - Generating through collaboration (such as communities of practice, brainstorming).
- Knowledge assimilation (assimilating is an activity that involves storage and/or distribution of acquired, selected and/or generated knowledge within the selected organization):
 - Formal internal publishing (such as broadcasting a new regulation via e-mail, populating a data warehouse, making experts' knowledge available by developing expert systems, systematically transferring knowledge, publishing policy manuals, communicating strategies).
 - Informal internal publishing (such as posting an idea on an Intranet, adding to the lessons learned/best practices repository).
- Knowledge emission (emitting knowledge is an activity that uses existing knowledge to produce organizational outputs for release into the environment):
 - Formal external interaction (such as providing technical support, giving lectures/presentations, forming joint ventures, offering advisory services).
 - Informal external interaction (such as communities of practice, discussion).
- Knowledge measurement (measurement is an activity that involves the assessment of knowledge resources, knowledge processors, and knowledge management activities):
 - Measuring knowledge resources (such as knowing what the organization already knows, creating and cataloging the corporate memory, performing knowledge audits).
 - Valuing knowledge (such as appraising intangible assets, estimating intellectual capital ROI, asking internal clients how much they would pay for the value received).
 - Measuring effects of KM (such as linking specific processes to KM to discover direct impacts, using a knowledge sharing effectiveness inventory, measuring time, money and personnel time saved, measuring percentage of successful programmes compared to before KM, measuring effects of individual knowledge manipulation).
- Knowledge control (control is an activity concerned with ensuring that needed knowledge resources and processors (including human and/or computer based processors) are available in sufficient quantity and quality subject to constraints and required protections):

- Protecting/Providing access control (such as developing technological protection of knowledge, ensuring legal protection of knowledge, enforcing intellectual property, allowing access to employees where appropriate).
- Managing/Monitoring KM (such as establishing or enforcing controls on the performance of KM activities, improving defect analysis and customer service).
- Knowledge coordination (coordination refers to the activity of guiding the conduct of KM in the selected organization):
 - Explaining KM to employees (such as communicating the results of pilot tests, making the concepts real, using successful best practices as examples, storytelling, demonstrating the individual and group value of shared knowledge).
 - Establishing incentives and motivating employees (such as aligning rewards and performance evaluation with KM, making sure personal & organizational benefits of KM are clear, rewarding knowledge sharing, discouraging knowledge hoarding, and spotlighting team players).
 - Securing sponsorship (such as obtaining management buy-in, making sure management understands and is ready to promote KM).
- Knowledge leadership (leadership is an activity that establishes enabling conditions for fruitful KM):
 - Aligning KM with business strategies (such as developing intellectual asset tactics and strategy to support business strategy, relate intellectual property to business use, focusing the KM vision and practice to support and align with enterprise strategy and direction, embedding KM in the business model).
 - Delegating activities (such as making sure someone has primary responsibility for making KM and sharing happen, appointing a champion who understands the need and has the clout and resources to devote to supporting KM, empowering people to contribute to the system).

5.5.2 The GM questionnaire

Beyond the basic causal structure, the author has sub-categorized the questionnaire as follows:

- Why are you performing KM?
 - As related to corporate.
 - As related to the division's performance.
 - As related to the division's operational and business results.
 - Because KM is known to ...
 - Because you believe that ...
- What are you doing on behalf of KM performance?
 - Leading.
 - Coaching.
 - Managing.
 - Lecturing.

- Educating.
- Monitoring.
- How are you performing KM?
 - As specified by the KM handbook.
 - As you interpret the KM directive.
 - Relying on experts.
 - Intuitively.
- When are you performing KM?
 - In case of crisis.
 - To avert danger.
 - Connected to events.
 - Regardless of occasion.

5.5.3 The knowledge manager questionnaire

The knowledge manager questionnaire resembles very much the GM questionnaire. It too, has been further categorized beyond the basic causal structure, as follows:

- Why are you performing KM?
 - As related to the GM.
 - As related to the division's performance.
 - As related to the division's operational and business results.
 - Because KM is known to ...
 - Because you are convinced that ...
- What are you doing on behalf of KM performance?
 - Leading.
 - Coaching.
 - Managing.
 - Lecturing.
 - Educating.
 - Monitoring.
- How are you performing KM?
 - As specified by the KM handbook.
 - As you interpret the KM directive.
 - Relying on experts.
 - Intuitively.
- When are you performing KM?
 - In case of crisis.
 - To avert danger.
 - Connected to events.
 - Regardless of occasion.

5.6 Using interviews to refine questionnaire's information

The questionnaires have been the source of valuable information that has been analyzed in chapter 7. Nevertheless, the verbal media of an interview is adding colour to this information and has enabled the author to refine it. Moreover, the reader should be reminded of the peculiar position of the

researcher being in charge of the implementation of the KM programme in IAI. The interviews conducted during about 90 minutes in a group consisting of the GM of the division and of his knowledge manager, were a very efficient way of facilitating the communication between them.

5.6.1 The semi-structured interview

The GMs and the knowledge managers of the five case study divisions were notified in advance of the intention to conduct a meeting with purpose in mind of discussing three topics:

- The relation of their KM programme to the division's core interest and to what constitutes their focal business goal.
- The process by which the KM programme is being managed and monitored in the division.
- Responsibility and authority of the knowledge manager.

They were reminded of the questionnaire filled four to five months before, were assured again that it has not been shown to anybody and certainly not to the respective opposite parties in the division, and were told that this discussion was in continuation to the filling of the questionnaires.

5.7 Researcher observations

The author has been involved with the programme as a leading member of the steering committee in charge of its definition before it has been established; he has designed the KM programme out of the strategy proposed by the steering committee together with a group of consultants, and has managed it since its establishment. Managing such a programme, means lecturing about it at all levels of personnel across the company, but also going from one division to the other, to meet with the local GM and knowledge manager and get their view about the implementation of the programme, its challenges as well as its successes.

5.7.1 Quarterly reviews

Reviews of the programme implementation status are being held on a quarterly basis by the director of knowledge. Typically, this is occurring toward the end of the quarter, is attended by the division's knowledge manager and by the directorates' knowledge leaders, and is being held at the division's premises so that the attendees feel 'at home'. The review medium is the PDM presented and criticized from its location on the IAI-Net. The PDM is being constructed, and latter updated at its location on the IAI-Net, so that it is constantly open for observation by all employees of IAI. A few days prior to the review, the PDM is checked by the director of knowledge and remarks and comments are being sent to the division's knowledge manager.

The first quarter's review is dedicated to a discussion about the division's rationale for choosing the specific KM procedures, having in mind the purpose of the programme which is to support the division's goals. Additional rationales would be the not yet achieved residual targets of the preceding year, and the results of the mutual assessment, usually performed at the beginning of the year for the preceding one. The planning content of the

yearly programme is being presented; the measures and their targets are evaluated to be realistic but yet challenging; the actions are checked for their potential efficacy of achieving the targets, and for their distribution among the directorates and their knowledge leaders.

The second, third and fourth quarter's reviews are conducted on derivatives of the PDM exposing the achievements to date as compared to the targets, and the plans of the division to overcome the deficiencies.

A discussion on the lessons learned from the actual year implementation programme is added to the fourth quarter review. The occasion is used to also discuss the possible budget needs for the following year implementation programme.

Those reviews are not based on presentations and are using the raw and real-time material of the PDM as is documented on the IAI-Net; they also do not include any approval function from the side of the director of knowledge; the most that would be heard in them are substantiated critical remarks and recommendations for improvement. The VP for R&D and Strategic Planning, to whom the director of knowledge reports, is usually present at the second and fourth quarter reviews.

5.7.2 Day-to-day observation

The director of knowledge is in contact with the divisions' knowledge managers on a day-to-day basis, both on his initiative, to promote issues which have been stagnant as it reflects from the PDM follow-up, or on their initiative to resolve difficulties they have encountered in the implementation.

The knowledge managers have been meeting on a monthly basis ever since the beginning of the programme. Those meetings have been conducted every time at the premises of another knowledge manager; the first hour of the meeting has been dedicated to the hosting knowledge manager who presented his way of implementing the programme; a subject common to the knowledge managers was presented and discussed; and, the knowledge managers were comparing notes on their successes and difficulties.

The divisions' GMs are considered as the customers of the programme. The director of knowledge meets them at least three times a year and hears their view on the programme and its implementation:

- During the first quarter of the year at the mutual assessment review.
- At the 2nd quarter review session.
- At the 4th quarter review session when requesting the following year budget.

A very partial report of additional day-to-day observations is brought as appendix 12.

5.8 Chapter overview

The author has established a basis for analysis represented by five out of the 23 divisions of the company, well distributed around the average, and all being properly substantiated with data from the PDM, from the mutual assessment review, and from interviews, to give the relative assurance that the research is not based on a biased choice.

Various definitions of success have been examined, and their scope has been limited by the context in which it can be seen in an operational way – a sustainable programme for the enhancement of the firm's competitive advantage and the achievement of its operational and business goals.

Nevertheless, the author deals with programme success that eventually would lead to business success; success defined in terms of performance of the programme as prescribed rather than in terms of outputs and results. The tools for the measurement of success are the PDM and the mutual assessment process. Success has been considered as a variable dependent on the factors to be described in chapter 6. The achievements associated with the progress of KM implementation have been defined by describing the conditions for the PDM and for the mutual assessment to be successful.

The author has used a structured questionnaire to gather the GMs and the knowledge managers' positions on issues related to knowledge management and to its implementation process. The organization of the questionnaires, their advantages as well as their dangers, and the sources that have influenced their design have been exposed.

The author then went another step forward and refined the information attained from the questionnaires, using the process of a group interview for the GM and the knowledge manager of the division chosen to serve as a case to be studied.

To this information the researcher has added his observations coming from scheduled as well as unscheduled meetings with relevant parties.

6 Success Factors

"Success is a journey, not a destination." Anonymous

6.1 Comparative patterns of factors

The research question inquires for success factors in the implementation of a *sustainable* knowledge management programme. This chapter will deal with those factors, their generation, their research, their function with relation to the various roles involved with the implementation of KM and their effect on the result analysis (brought in chapter 7). The process is illustrated in figure 6-1:

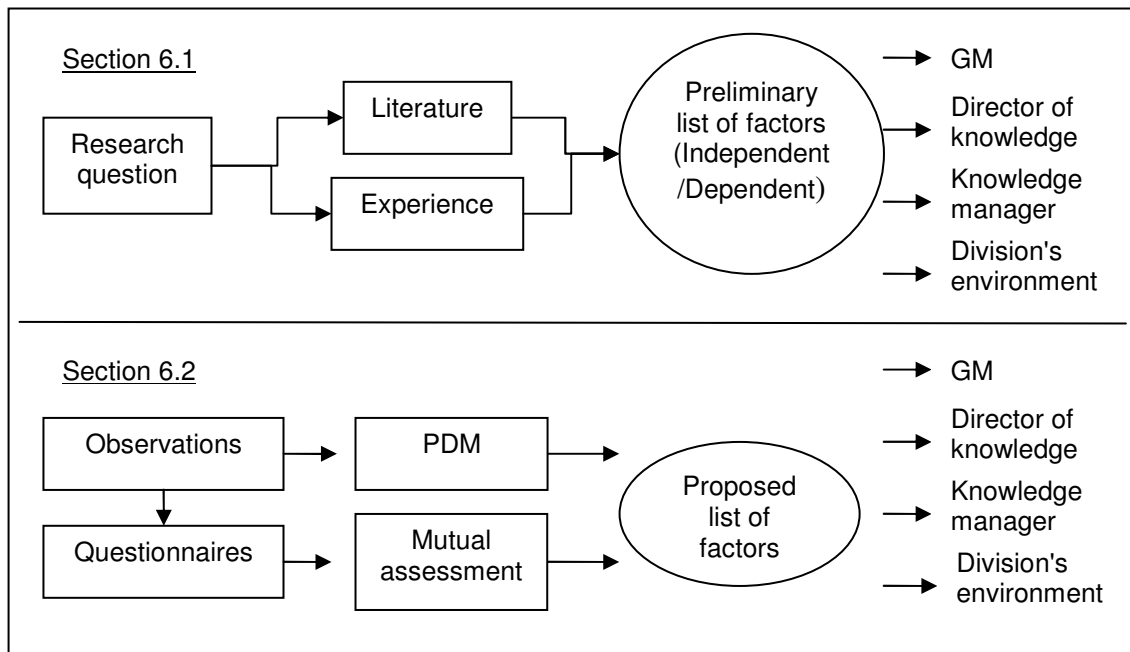


Figure 6-1: The success factors generation

Based on the research question, the author has reviewed the literature for factors liable to influence the implementation of knowledge management in organizations. He has then moderated that list using his experience and the judgement drawn from it, and made a list with reference to the roles involved with KM implementation. The next step was to show the interaction between those roles by differentiating between dependent and independent factors. The author has used this list of dependent and independent factors in the design of the GM and of the DKM questionnaires. This preliminary list of factors was then combined into a proposed one, and for each one of the seven proposed factor a definition, a qualification set, a list of keywords, and a bibliographic perspective was provided.

The author then deduces a relationship between those factors and the four sources of information available to him: the questionnaires (questions and answers), his personal observations, the PDM, and the mutual assessment results. The proposed list of factors shown in table 6-4 is then handed to chapter 7 for analysis.

6.1.1 Factors from the literature

As one could see in section 3.4, the literature has provided us with a profusion of factors claimed to be success factors or inhibitors of barriers in the implementation of knowledge management, by eminent thinkers and researchers in the matter. Table 6-1 shows a partial list of the factors the author has found in the literature:

Factor	Significance	Sources
Business benefits	Critical 'alignment' factors aligning knowledge processes to existing business processes.	Herder et al. (2003)
Communication	Organization-internal communication of goals, efforts and results.	Martensson (2000), Mason & Pauleen (2003), Kalling (2003)
Creativity	Intellectual inventiveness. It has been argued that for effective knowledge management, it is critical to find the balance between structure (systematisation and organization) and chaos (creativity and innovation).	Alazmi and Zairi (2003), Martensson (2000), Skyrme and Amidon (1997), Lloyd (1996)
Culture	The behaviours and attitudes that define a group, company, or organization (see also section 3.3.7).	Alazmi and Zairi (2003), Wong & Aspinwall (2005), Herder et al. (2003), Martensson (2000), Mason & Pauleen (2003), Liebowitz (1999)
Horizontal communication	Peer reviews and other communication irrelevant of the hierarchical or the profit centre structure of the organization.	Kalling (2003)
Incentives and motivation	Unwillingness to absorb or share knowledge; could be dealt with through socialization, compensation, documentation, toleration, communication, and rotation, though the common approach is to prefer cognitive and relational factors.	Polanyi (1962), Kalling (2003), Martensson (2000), Mason & Pauleen (2003)

Factor	Significance	Sources
Individual initiative and commitment	Directors of KM initiatives need to be concerned with the knowledge chain's classes of activities, and with cultivating, harnessing, and organizing an organization's KM skills in performance of these activities.	Bij, Song, et al. (2003), Kalling (2003), Park, Ribiere, et al. (2004)
Internal competition	Programme implementation results publicized to encourage division at least not to be the worst.	Kalling (2003), Mason & Pauleen (2003)
KM strategy integration with corporate strategy	The integration of knowledge management process into the business management process and strategic thinking enables applying the KM tools to the business where they are most needed.	Chauvel and Despres (2002), Herder et al. (2003), Martensson (2000), Mahti (2004), Skyrme and Amidon (1997), Liebowitz (1999)
Knowledge infrastructure	KM roles such as a CKO, knowledge managers, knowledge leaders, competence centre content managers, community of practice leaders and sponsors.	Wong & Aspinwall (2005), Alazmi and Zairi (2003), Mahti (2004), Liebowitz (1999)
Knowledge strategy, vision and architecture	A rational strategy helps to clarify the business case for pursuing KM, and steer the company towards becoming knowledge-based; provides the essential focus, as well as values for everyone in the organization.	Alazmi and Zairi (2003), Wong & Aspinwall (2005), Chauvel and Despres (2002), Herder et al. (2003), Mahti (2004), Skyrme and Amidon (1997)
Knowledge-sharing culture	To create a knowledge sharing culture is to make a visible connection between sharing knowledge and practical business goals, problems or results.	Alazmi and Zairi (2003), Chauvel and Despres (2002), Martensson (2000), Mahti (2004), Skyrme and Amidon (1997), Mason & Pauleen (2003), Park, Ribiere, et al. (2004)
Local perception	The way local managers and workers view the programme, and view their organization in perspective of the rest of the company.	Kalling (2003)
Long-term orientation	Offers a stable strategic direction. The costs of learning are immediate, and the benefits are long-term.	Bij, Song, et al. (2003)

Factor	Significance	Sources
Management control	Planning for yearly goals, measurement and targets; specifying actions and people responsible to achieve them; and following up on them.	Kalling (2003)
Management leadership and support	Promoting a corporate mindset that emphasises co-operation and knowledge sharing across the organization; creating an environment in which knowledge creation and cross-boundary learning can flourish.	Alazmi and Zairi (2003), Wong & Aspinwall (2005), Bij, Song, et al. (2003), Chauvel and Despres (2002), Herder et al. (2003), Kalling (2003), Martensson (2000), Mahti (2004), Skyrme and Amidon (1997), Mason & Pauleen (2003), Park, Ribiere, et al. (2004), Liebowitz (1999)
Measurement and evaluation	A system that enables the evaluation of attempts that are made to use KM and the benefits from it.	Wong & Aspinwall (2005), Martensson (2000), Mahti (2004), Mason & Pauleen (2003)
Organizational crisis	The shared sense of an internally constructed crisis among organization members intensifies their efforts to expedite learning and thus the absorptive capacity of the organization.	Bij, Song, et al. (2003)
Organizational infrastructure	The organization being primordially vertically or horizontally organized and how does it affect the transfer of knowledge; the existing ways for communication.	Wong & Aspinwall (2005), Herder et al. (2003), Kalling (2003)

Factor	Significance	Sources
Processes and activities	Emphasis on processes rather than on outcomes.	Wong & Aspinwall (2005), Herder et al. (2003), Mahti (2004), Holsapple & Jones (2004)
Risk-taking behaviour	Emphasis on processes rather than outcomes, legitimisation of 'intelligent' ¹ failure, development and maintenance of individual commitment to 'intelligent' failure through organizational culture and design, and emphasis on failure management systems instead of individual failures.	Bij, Song, et al. (2003)
Strategic similarity	The extent to which units are related strategically and are dependent upon each other.	Kalling (2003)
Time	The resource it takes to implement the methodology of the programme. Creating a formal learning network makes the identification and transfer of effective practices as part of the job.	Martensson (2000), Mason & Pauleen (2003)
Training	This dimension refers to the training and management that are necessary for the process to achieve its desired result, particularly when it involves multiple employees.	Alazmi and Zairi (2003)
Transferring knowledge	The processes by which members within an organization learn from each other, without interacting with the environment.	Alazmi and Zairi (2003), Kalling (2003)

Table 6-1: Success factors from the literature, their significance and their source

6.1.2 Factors from experience

At the early stages of the research, the author perceived the factors affecting the KM implementation to refer to the roles involved with it, namely to the GM, the division knowledge manager (DKM), the director of knowledge (DoK), and the division as representing the environment in which the implementation has to take place. These as listed in table 6-2, are in fact comparable to those found in the literature:

¹ Failure that is likely to facilitate learning (Bij, Song, et al. (2003)) (see appendix 3).

Role	Factor
GM	Link to business
	KM organization
	Monitoring
	Recognition
	Management support
DKM	Profile
	Creativeness
	Time allocation
DoK	Programme balance & timing
	Corporate management attention
	Programme management
	Evaluation, measure & publicity
The division	Business results
	Specific knowledge
	Competence centres
	Innovation practice
	Sharing practice
	Communication practice

Table 6-2: Original list of factors

The author, later developed this list and the diamond shaped model (introduced in section 4.4.3) started to emerge. The list of factors was modified, included an independent/dependent classification and also grew as shown in table 6-3 and in appendix 4:

Role	Independent/ Dependent	Factor
GM	Dependent	Connection to agenda
		KM plan and organization
		Programme monitoring
		Management support
	Independent	Abstract values
		Long term values
		Corporate demand
		Consideration of division as self contained
		Perception of relevance
DKM	Dependent	Relating programme to division performance
		Initiative
		Resource and time allocation
		Programme performance, monitoring and communication
	Independent	Personal and professional profile
		Position in organization
		Enabler for career building
		Management support

Role	Independent/ Dependent	Factor
		Other activities being complementary
DoK	Dependent	Programme content, balance and timing
		Procedures usage
		Evaluation, measurement, and publicity
		PDM as a management tool
		National and international exposure
	Independent	Corporate involvement
		Customer requirement
The division		Division's business results
		Division's organization
		Specific knowledge
		Documentation practice
		Reuse practice
		Innovation practice
		Sharing practice
		Communication practice
		Openness to lessons learned

Table 6-3: Preliminary list of factors

6.1.2.1 Independent factors

Some of the factors the author is dealing with are independent variables in so far as they are not reliant on a cognitive decision of the subject the factor operates on. For example, the GM or the DKM having abstract or long term values is a virtue they bring with them; corporate demanding the division to perform one way or another is a factor in the equation, but it is not dependent on the GM; management support, being exercised by the GM, is an independent factor from the point of view of the DKM.

6.1.2.2 Dependent factors

On the other hand, this same management support is a dependent factor from the point of view of the GM and he would have to make a cognitive decision to exercise it. Performing the programme or relating it to division performance, would then be dependent on the decision made by the role bearers; as it would be for allocating resources, taking an initiative, or connecting the programme to the division's agenda.

This research has not ventured into the secondary effects of dependence mentioned briefly in the definition for the label "management support" in as much as a requesting subject takes by this request some responsibility over performance while a supported function could create expectancy for such support, could act to make it happen, but could also be reliant on.

6.1.3 The factors influencing the roles active in KM implementation

6.1.3.1 Factors related to the GM

- What is the GM's ability to view and conceptualise abstract values. KM basic paradigms are to value spontaneity and self-organisation as in communities of practice, yet to emphasise the importance of systematic processes and management.
- What is the GM's ability to materialize the advantages concealed in long term values (the sustainability problem). KM is still facing the challenge of being sometimes considered as a 'passing fad' or 'expensive and not-value-adding overhead'; there is growing pressure to show its 'Return On Investment' (ROI); it constantly tries to convince management to invest in process improvement for the long run and not just focus on short term; it is even at constant risk of shrinking or disappearing.
- What is the GM's perception of the importance of the KM programme for the business success of his division and of what would be the specific competitive advantage, it would gain from it?
- How are the operational and business division's agenda, driving the KM programme by prioritising its activities?
- How is the division's GM supporting the programme and how does he show it?
- Is there a monitoring process for the KM programme, and what are its rate and intensity?
- The establishment of a KM organization by the nomination of KM leaders in the various directorates to give the process local and actual significance.
- Is the division considered as self-contained and not requiring outside knowledge in addition to its own?
- Is there a requirement by corporate (whether implicit or explicit) to implement KM?

6.1.3.2 Factors related to the division knowledge manager

- What is the formal position of the knowledge manager in the division's hierarchical echelon and how does it affect his ability to perform? KM is a support function; the implication is that it does not create direct value; rather it helps others to deliver products or services to the market and to create value for the organisation.
- What is the division knowledge manager's perception of the importance of the KM programme for the success of the division and what would be the specific advantage to his other activities, he would gain from it?
- What is the knowledge manager's personal and professional profile, his seniority, and how do they help him perform?
- What are the knowledge manager's other activities, their being complementary to KM, and how do they help him perform?

- The knowledge manager is expected to be employed as such for no more than 30% of his time so that he can keep an operational status within the division. How does the knowledge manager allocate time for the KM programme?
- Does the knowledge manager use division performance related KM procedures within the division's KM programme.
- The communication process was recognized as an enabler for the people value at IAI and was therefore constructed as an action with a very specific set of responsibilities and scheduling. How does the division knowledge manager use it within the division to influence KM implementation?
- How does the knowledge manager apply creatively the KM programme?

6.1.3.3 Factors related to the division's environment

- What was the division's general business situation during the evaluation period and how could this affect the implementation of the KM programme? Was the business situation so good, as there could be an atmosphere of complacency, mixed with a sense of urgency to operationally perform without thinking about how to prepare for more difficult times; or is it as bad as it needs immediate solutions and not long term processes as the KM one are.
- Is there awareness for company-specific and product-specific knowledge within the division and are these cultivated. Roth (2002) relates to it as an enabler for assuring sustainable growth and efficiency of organisations and quotes (Nonaka and Takeuchi, 1995). How are these used to enhance the division's intellectual property?
- Is the division's organisation, within the overall matrix arrangement, mainly project oriented or technology proficiency oriented with importance given to the competence centres and to their expertise, and how does it influence the knowledge sharing potential and the value of the intellectual property? The definition of competence centres (Prahalad and Hamel, 1990) at the division level, of their responsibilities and of the correlation between those and their competency. The issue was approached within the process of strengthening the innovation and technology value with an action called the make/buy analysis. The Cambridge method (Probert, 1996) was used to identify competence centres within the divisions and to categorise their proficiencies as such that needed to be made in house versus those that could be outsourced.
- Is documenting a practice, done in an organised way, and encrusted in everyday work processes? What resources are involved, what are the practices as well as the difficulties?
- Is reusing a practice, done in an organised way, and encrusted in everyday work processes? What resources are involved, what are the practices as well as the difficulties?

- Is there openness to lessons learned gathering and application across the division? What resources are involved, what are the practices as well as the difficulties?
- Is sharing a practice, done in an organised way, and encrusted in everyday work processes? What resources are involved, what are the practices as well as the difficulties?
- Is there an ecology for innovation within the division?

6.1.3.4 Factors related to the director of knowledge

- The balance and timing between culture, processes, and technology in the application of the KM programme consist of the KM strategy and architecture. Balancing between culture, processes and technology; and between division, company and extended enterprise context (including customers and suppliers) at different times along the programme implementation; and using various technologies are the construct of the programme.
- The definition of the KM procedures in a KM handbook validated with the DKMs and updated on a yearly basis for their usage. There are many definitions, approaches, doctrines, frameworks, and procedures to KM, and in many cases they could be regarded upon as fancy terms for activities anyway performed.
- The tailoring of KM evaluation and measure, self and mutual assessment, performance, throughput and business result measures and the use of their publication to achieve better implementation results.
- How does the director of knowledge leverage the attributes of the PDM method to manage the programme?
- How does the director of knowledge draw corporate management attention to the implementation of the programme?
- National and international exposure. Annual presentation at least at one international and national conference. These are enabling the programme to be put to the critic of the public and to provide the knowledge managers with the assurance of its quality.
- Customer requirement – KM is mentioned in the CMMI standard which is expected to be a requirement of the US DoD. This fact is expected to revolutionize the attitude to KM and is highlighted in a conference paper published by the author (Dayan and Evans, 2006).

6.1.4 Proposed model of factors

The author made at this point the deliberate choice of concentrating on the factors related to the GM and to the DKM, while those related to the director of knowledge and to the division environment were still kept in the background (as the reader will be able to appreciate in the division analyses (appendix14, section 14.9 to appendix 17, section 17.9). The GM and the DKM factors were then aggregated using the structure of a thematic approach (Boyatzis, 1998), and to each group of factors a label was attached as a proposed factor shown in table 6-4:

Preliminary factor	Proposed factors
Abstract values	Long term values
Long term values	
Corporate demand	Management support
Management support	
Perception of relevance	Perception of relevance to division performance
Relation to division performance	
Consideration of division as self-contained	Division self perception
Programme performance	Quality of performance of the programme
KM plan & organisation	
Programme communication	
Programme Monitoring	
Personal and professional profile	DKM profile
Position in organisation	
Enabler for career building	
Other activities being complementary	
Connection to agenda	Initiative
Resource allocation	
Initiative	

Table 6-4: Labelling groups of factors

The factor components (preliminary factors) listed above were very instrumental in the design of the questionnaire (described in section 5.5.1 and attached as appendices 10 and 11). The questionnaires have been actually designed with the following factors in mind:

- Independent variables:
 - Abstract values (backed by 4 questions).
 - Long term values (backed by 17 questions).
 - Perception of relevance (backed by 30 questions).
 - Corporate demand (backed by 6 questions).
 - Consideration of division as self-contained (backed by 3 questions).
- Dependent variables:
 - Connection to agenda (backed by 31 questions).
 - Management support (backed by 5 questions).
 - Programme monitoring (backed by 7 questions).
 - KM planning and organisation (backed by 10 questions).

The proposed groups of factors, presented in appendix 5 are now presented in details. For each one the author includes:

- An icon (to be used later in the text whenever this factor is mentioned).
- The factor components (their relation with the preliminary list of factors).
- The factor definition – a characterization of what the factor concerns (to be addressed in the division analyses (appendix14, section 14.9 to appendix 17, section 17.9)) (Boyatzis, 1998 p.53).

- The factor qualification, limiting it to a specific role bearer and differing between dependent and independent factors – a description of any qualifications or exclusions to the identification of the factor.
- Keywords relevant to the factor.
- A limited bibliographic perspective to it.



6.1.4.1 Long term values

- Factor components:
 - KM as an enabler of long term values.
 - KM as an enabler of abstract values.
 - Culture as a management task.
- Definition: Qualities one should care for because they are expected to be advantageous in the long run for the benefit of the individual and of the division.
- Qualification: Independent variable, referring both to the knowledge manager and to the GM though it is more expected from the latter. Inclusive of values considered abstract as trust, experience, principles, promises, or culture.
- Keywords: Innovation, enhancing ability, Intellectual Property, New Product Initiative (NPI), Capability Maturity Model Integrated (CMMI), attraction and retention of personnel, process analysis and knowledge, collaborative acquisition, documenting, sharing, lessons learned, communication, collaboration.
- Bibliographic perspective:
 - Hubert Saint-Onge, interviewed by Jay Chatzkel, in the Journal of Intellectual Capital (Chatzkel, 2000), relates to two main value shifts, necessary prior to any implementation of a KM programme – to move from an entitlement culture characterized by dependence to a culture based on self-initiative and interdependence; and to shift from a narrow self-centred perspective to interdependence and the ability to partner.
 - Richard McDermott and Carla O'Dell in an article in the Journal of Knowledge Management (McDermott and O'Dell, 2001), defined culture as the shared values, beliefs and practices of the people in the organisation. To them, core values typically embody what people really consider important, what they think is key to getting ahead and 'playing the game of life' in that organisation, even when they don't talk about their organisation's underlying values.
 - Victor Newman in the Journal of Knowledge Management: 'Knowledge as a concept requires definition or reinvention in terms of delivering New Market Values of expectations. The ability to create knowledge about the future and learning to implement it quickly in the form of a technology will become a core organizational competence' (Newman, 1997).



6.1.4.2 Management support

- Factor components:
 - Dependence on the GM.
 - GM's dependence on corporate.
 - Pride for KM.
 - GM's recognition that KM is part of his success criteria.
 - Knowledge manager's empowerment by the GM.
 - GM's explicit support.
 - GM's recognition of doers.
- Definition: Management expression of confidence, sometimes open and public, based on a definition of requirements, taking responsibility for them, and on partnership in their achievements. Relied upon as a source of authority by the performing level.
- Qualification: Dependent variable for the supporter; independent for the supported. The message the GM is getting from corporate and the knowledge manager from the GM; its intensity, hint for flexibility, and its publicity. Creating a sense of partnership between the supporter and the supported. If expressed openly, can be a major tool for the knowledge manager to perform.
- Keywords: Active and open support, recognition, empowerment, participation, corporate recognition, dependence, commitments, achievement publication, criteria for success.
- Bibliographic perspective:
 - Management support has been ranked in the first places of the lists of success factors by Davenport et al. (1998), Martensson (2000), Liebowitz (1999).



6.1.4.3 Perception of relevance to division performance

- Factor components:
 - KM as an enabler for improved capability.
 - KM as an enabler for improved performance.
 - Using incentives to promote KM.
 - The validity of return on investment on KM.
 - The applicability of KM below the management level.
 - Knowledge managers as participants in short term activities.
 - Using throughput measures to 'sell' KM to personnel.
 - Using business result measures to 'sell' KM to management.
- Definition: Activity or quality recognised to enable concrete and short term benefits for the division and treated accordingly.
- Qualification: Independent variable on the part of the GM and of his perception. Its treatment by the knowledge manager, for whom it is a dependent variable, is dependent on his ability to relate the programme to the division's performance.

- Keywords: Short term values, skills, information provider, processes, experts, productivity, quality, Return on Investment (ROI), level of business relation, division-specific and product-specific knowledge, incentives, knowledge activities, knowledge perception, using lessons learned, results publication, measuring results, communication.
- Bibliographic perspective:
 - (Davenport, de Long, and Beers, 1998; Liebowitz, 1999 cited in Alazmi and Zairi, 2003) define some of the areas in which satisfactory results ensure successful competitive performance, and call those areas critical success factors (CSFs).
 - It has been claimed that the prescription for managers might be summarized as being a framework for exploration as much as a prescription for improving practices and, hence, performance (Skyrme and Amidon, 1997 cited in Armistead, 1999).



6.1.4.4 Division self perception

- Factor components:
 - Dependence on other divisions.
 - Horizontal versus vertical organization.
 - Awareness for division-specific or product-specific knowledge.
 - Openness to knowledge from external sources.
 - Openness to using external experts.
 - The business situation and its effect on KM performance.
- Definition: The way the division considers itself and acts accordingly. Consideration of division as self-contained and organised to suffice itself.
- Qualification: Independent variable, referring to the GM who will not look for external sources of information and capability. The knowledge manager will consequently work to achieve internal self-dependency.
- Keywords: Vertical organisation, Intellectual Property, security.
- Bibliographic perspective:
 - In a study dealing with leading successful self-managed teams, one of their characteristics was in their being socially and politically aware of company's informal policies; another, was to create the relationship needed to enable obtaining external support if and when needed (Druskat, 2004).



6.1.4.5 Quality of performance of the programme

- Factor components:
 - Belief KM has been performed without calling it as such.
 - Organising for KM.
 - Activity in performing KM.
 - Communicating KM.
 - Monitoring KM.

- Definition: Doing as prescribed in the KM handbook, properly applied to the division's environment, and in accordance with its work plan.
- Qualification: Dependent variable referring both to the GM and to the knowledge manager. General direction, guidance, and monitoring on the part of the GM and its detailed day-to-day application by the knowledge manager.
- Keywords: Dealing with knowledge, practicing by the KM handbook, levels of personnel, relation to the Competitive Advantage Initiative (CAI), communication, training, formal and informal publishing, openness, communication means, part of business strategies, part of division's work plan, short term activities.
- Bibliographic perspective:
 - Implementing KM remains a challenging task for organizations and as Drucker (1993), a father of modern management theory, has asserted, one of the most important challenges facing organizations in a contemporary society is to build systematic practices for managing knowledge.
 - A study by the American Productivity and Quality Centre (APQC, 1997 cited in Amaravadi and Lee, 2005 p.66) concluded: "If you do not have a knowledge management strategy, a *framework*, and an information technology to support it, ...you end up in chaos".



6.1.4.6 Knowledge manager profile

- Factor components:
 - Managerial level.
 - Position.
 - Seniority.
 - Importance attributed to the managerial level.
 - Importance attributed to seniority.
 - Importance attributed to publicity.
 - Exclusivity in dealing with KM.
 - Relationship to other tasks.
 - Pride for KM.
 - Ambition to promote the division to a leading position in process knowledge.
- Definition: Personal and professional background of the knowledge manager, his seniority, and his position in the organisation.
- Qualification: Independent variable referring to the knowledge manager. Ought to be relevant to his choice and appointment by the GM. Inclusive of the knowledge manager's seniority, the definition of his other tasks and their relation to KM, and the perception of KM being an enabler to his career building.
- Keywords: Task, seniority, position, infrastructure, goals, leader, tutor, trainer, manager, success, Quality Management (QM), Information Technology (IT), Human Resources (HR), Change Management.
- Bibliographic perspective:

- A list of 44 'organizational culture profiles have been established to enable successful KM implementation (Park, 2001). Among which are the knowledge manager profile traits as trust, flexibility, stability, being innovative, rule oriented, team oriented work, decisiveness, tolerant of failure, taking initiative, and sharing information freely.



6.1.4.7 Initiative

- Factor components:
 - Time allocated to KM.
 - Consideration of KM as a recommendation only.
 - Securing sponsorship.
 - Creative contributions to the programme.
- Definition: Finding ways and resources to make it happen.
- Qualification: Dependent variable comprising of the creativity expected from the knowledge manager in the application of the programme and the resource allocation expected from the GM.
- Keywords: Time and funds allocation, active with management, active at implementation, active with additional ideas, active measurement.
- Bibliographic perspective:
 - It has been suggested that directors of KM initiatives need to be concerned with the knowledge chain's classes of activities, and with cultivating, harnessing, and organizing an organization's KM skills in performance of these activities (Holsapple and Jones, 2004b)).
 - Larry Prusak (when he was with Ernst & Young) looked at the subject from the perspective of its strategic significance, the critical area of the implications for working practices, roles and responsibilities, as well as the resources likely to be required for integrating the practice into a company's culture (Lloyd, 1996).

The author has by now established a resulting pattern of factors, their significance, and their dependence categorization, such that could be related to the raw data collection (as it will be done in the next section) and analysed together with the results (as it will be done in the next chapter).

6.2 Deduction from raw data collection

The author uses the four sources of information available to him, the questionnaires (questions and answers), and his personal observations as they reflect in the 'table shells', the PDM, and the mutual assessment results to come-up with a proposed set of factors.

6.2.1 Based on the questionnaires

46 questionnaires were handed out (23 to GMs and 23 to DKMs), and 35 were answered (19 from GMs and 16 from DKMs), over a period of about ten weeks.

The author looked for some elements to convince himself of the candidness of the respondents beyond the expected and normal attitude to answer positively whenever given the chance for it:

- Corporate demand has an effect only when it is mandatory. All questions related to this factor were answered by GMs with a less than positive score (2.16 – 3.05). The only question which got a positive answer (with an average of 1.79) is 1.1.4 (Because KM activity is affecting other corporate commitments?). Since it is up to the GM to respect corporate demands, and definitely up to them to state their reaction to them, one can deduce from these answers the candidness of the GMs.
- The GMs were asked if they took pride at their division's KM accomplishments. Answers had a mode¹ 3 (partial) for all GMs. Looking at the KM performance of the five case study divisions (table 6-5), one can see some reasoning to the GM answer (at least on the part of the GMs of N, A, and U), showing some candidness.

Division	A	J	N	S	U
GM Pride	2	4	1	3	4
M/A 2004	1.47	0.87	0.93	1.3	0.7
Objectivity	0.98	0.46	0.49	0.78	1.17
S/A 2004	1.5	1.89	1.9	1.67	0.6

Table 6-5: GM's pride for KM performance as compared to self assessment results

- The DKMs' dependent variables are up to them. If they were pretenders they would respond more positively to the perception of relevance to division performance (average of 2.54), initiative (average of 2.34), programme performance (average of 2.67), programme communication (average of 2.61), and programme monitoring (average of 2.64). Again, this proves their candidness.

6.2.1.1 GM questionnaires

6.2.1.1.1 The process

The questionnaire was tested on the assistant to the VP of the NOPQ group who recently was a division GM and is supporting the programme in his group. His position has always been (even as a GM), that the deficiency of the programme is that it is not formally organized and budgeted² (all people dealing with KM are doing it in addition to their main job). He claims to support the programme because he believes in it, but argues that most if not all GMs do not (though they won't admit it). He believes that in the field of managing the change process³, the GMs do only what they must (probably because it is monitored by the COO), and that it is dependent on the personality of the GM,

¹ The answer mostly appearing.

² Meaning having knowledge managers and leaders fully budgeted and dedicated to the job of KM implementation. This is a matter of principle for the DoK who believes it is primordial to have as DKMs people active in the operation of their division and not deferred to the honorary position of knowledge manager.

³ Detailed in section 4.3.

(as noted among the factors). He remarked that many questions are biased, politically loaded and are bound to draw a dishonest positive answer¹. He says that he answered the questionnaire as he expects the GM to answer though he also stated that he all along tried to force himself to answer as he personally thinks today. His answers were indeed generally more negative (2.6), than the average that includes his score eventually came out (2.17).

23 GMs were hand-given the questionnaire between the 11.01.05 and the 16.01.05, together with a brief verbal explanation that since they are considered as the DoK's prime customers, he would be interested in their point of view about possible reasons and ways to implement KM. The request was to answer by the 31.01.05.

Four GMs didn't answer (one said that he doesn't believe he can provide any added value, and one said he doesn't have the time for it). One GM (who considers himself as an expert on questionnaires) commented that some questions contain multiple issues, many of them are not concrete enough, some are statements that are difficult to grade, they include a title (Why, How, etc.) that creates a bias, and that some are inter-related².

The GMs were not aware of the fact that the author is actually researching the subject and considered him as the DoK who scheduled that questionnaire so that they are better prepared for the mutual assessment, conducted during the February-March period, and ahead of the interviews scheduled for April.

6.2.1.1.2 The questions

The 113 questions have been grouped in 4 sets covering the seven factors considered (details in section 5.5.2 and in table 6-6):

- Why are you performing KM? (5 sub- sets).
- What are you doing on behalf of KM performance? (6 sub- sets).
- How are you performing KM? (4 sub- sets).
- When are you performing KM? (4 sub- sets).

One can see that all factors considered and relevant to the GM, are being addressed through the GM questionnaire, so that it would be potentially possible to deduce a connection of the answers to those factors.

Looking at the GM questionnaire attached as appendix 10, one should be aware of the fact that the digit and letter in parenthesis brought at the end of each question was not part of the document handed to the GMs (they are brought there for the benefit of the reader since the researcher has tried to use them as instruments for the analysis). These are the locator of the question in a two-dimensional map of the answers the author created hoping it would reveal a pattern.

80 out of the 113 questions are worded in a way that a positive answer is expected. There are three options for a positive answer – (1) Very much, (2) Yes, (3) Partially and two for a negative one – (4) No, (0) Not applicable. Therefore, it made sense while looking for positive answers to hope a visual

¹ The author has to remind the reader that the researcher in him had sometimes, as in this case, to leave room for the DoK in him, who used the questionnaire exercise to transfer a message to the GMs and latter to the DKMs.

² Most comments are indeed justified and if the author had to design a questionnaire after the completion of this research, he would probably do it differently (as addressed in section 8.2.2).

pattern would emerge. Unfortunately, the result has been quite disappointing in that it is not consistent enough and doesn't seem to deliver a meaningful message, so this avenue of research had to be renounced.

Factor	Factor components	Qualification	Why	What	How	When	Total	Total
Long term values	Abstract values	Independent Variable	1	3			4	21
	Long term values		6	2	9		17	
Management support	Corporate demand	Independent Variable	6				6	11
	Management support	Dependent Variable			4	1	5	
Perception of relevance	Perception of relevance	Independent Variable	21	7	1	1	30	30
Division self-perception	Consideration of division as self-contained	Independent Variable		1	2		3	3
Quality of performance	Programme monitoring	Dependent Variable		5	2		7	17
	KM planning and organization		5	1	3	1	10	
Profile ¹		Independent Variable						
Initiative	Connection to agenda	Dependent Variable		14	9	8	31	31
Total			39	33	30	11	113	113

Table 6-6: Distribution of the GM questions by factors

6.2.1.1.3 The answers

The answers were received between the 13.01.05 and the 01.02.05. The one collected as a test from the deputy VP of the NOPQ group, who not to long ago was one of the GMs, was added to them; all together the researcher is dealing with 19 GM cases.

There were 31 cases of "No response" (14 of them from the same respondent) out of 2147 answers (19 respondent GMs multiplied by 113 questions that can be seen in appendix 10). This is probably a sign of cooperation from the part of the GMs². The author investigated the GM answers and looked for the mode by question category:

- Why are you performing KM?
 - As related to corporate: 2 (yes).
 - As related to performance: 1 (very much).
 - As related to results: 2 (yes).

¹ Not relevant to the GM.

² Also claiming reliability according to Goode and Hatt (1952) as mentioned in Sect. 2.4.1.

- Because it is known to: 2 (strong yes)¹.
- Because you are convinced that: 2 (yes).

It seems that the reputation of KM as a promoter of improved performance is playing a significant role.

- What are you doing on behalf of KM performance?
 - As a leader: 1 (very much).
 - As a coach: 2 (yes).
 - Directing: 2 (yes).
 - Lecturing: 3 (partial).
 - Training: 2 (yes).
 - Monitoring: 3 (partial).

The GMs view themselves as the leaders of their division and give high priority to the abstract values associated with them.

- How are you performing KM?
 - As specified in the knowledge handbook: 3 (partial).
 - As you interpret the KM directive: 2 (yes).
 - Relying on experts: 4 (no).
 - Intuitively: 2 (yes).

The chosen way is not as the manual directs or as experts recommend, but rather 'the way we do things around here'.

- When are you performing KM?
 - In case of crisis: 4 (no).
 - To advert danger: 1 (very much).
 - Connected to events: 2 (yes).
 - Regardless of occasion: 2 (yes).

Though KM is intuitively long term, the GMs take a practical approach and would involve it, maybe not methodically enough, with any case that could benefit from it.

The question on the business situation was generally answered as satisfactory. The affect it may have, was partially positive but not negative. The affect of a bad business situation was in both cases answered as not relevant (the only two cases of mode 0).

There is a clear minority of a NO answer (mode 4). The exceptions are:

- Dependence on corporate.
- KM is not affected by good business situation.
- KM doesn't refer only to technology issues.
- KM doesn't apply only to management.
- Human mobility is not used to transfer knowledge.
- Not relying on external experts for KM.
- Knowledge managers are not relevant in emergency cases.

GMs are strong on abstract values (or at least they pretend to be); the average score was 1.47. GMs seem also to be strong on long term values; the average score was 1.86.

¹ Between 'yes' and 'very much'.

6.2.1.2 DKM questionnaires

6.2.1.2.1 The process and the questions

Armed with the success the author has gathered in getting responses from the GMs on the questionnaire handed to them during the January to February period he went ahead and prepared a similar questionnaire which was handed to the DKMs during the 15.02.05 – 01.03.05 period, and was requested to be answered by the 17.03.05, (details in section 5.5.3 and in table 6-7).

Factor	Factor components	Qualification	Why	What	How	When	Total	Total
Long term values	Long term values	Independent Variables	8				8	8
Management support	Management support	Dependent Variables	2	4		1	7	7
Perception of relevance	Relation to division performance	Dependent Variables	9	4	1	6	20	20
Division self-perception ¹								
Quality of performance	Programme performance	Dependent Variables	6	8	3	2	19	35
	Programme communication		2	6	3		11	
	Programme monitoring			5			5	
Profile	Personal and professional profile	Independent Variables		3	5		8	30
	Position in organization		5	2	2	1	10	
	Enabler for career building		3	3			6	
	Are other activities complementary		6				6	
Initiative	Initiative	Dependent Variables		5	6		11	14
	Resource allocation				2	1	3	
Total			41	40	22	11	114	114

Table 6-7: Distribution of the DKM questions by factors

One can see that all factors considered and relevant to the DKM, are being addressed through the DKM questionnaire (appendix 11), so that it would be potentially possible to deduce a connection of the answers to those factors.

¹ Not relevant to the DKM.

6.2.1.2.2 The answers

The answers were received between the 01.03.05 and the 20.03.05.

There were 37 cases (31 of them from the same respondent) of "No response" out of 1824 answers (16 respondent DKMs multiplied by 114 questions). This is probably a sign of cooperation from the part of the DKMs. The author investigated the DKM answers and looked for the mode by question category (the answer mostly appearing):

- Why are you performing KM?
 - As related to the GM: 2 (yes).
 - As related to the division performance: 2 (strong yes)¹.
 - As related to the division's operational and business results: 4 (no).
 - Because it is known to: 3 (partial).
 - Because you are convinced that: 3 (partial).

It seems that the relationship of KM to the division's operational and business results is not clear to the DKMs as opposed to its activity (performance). It also seems that they are surprisingly less convinced than the GMs about the virtues of KM.

- What are you doing on behalf of KM performance?
 - As a leader: 2 (yes).
 - As a coach: 2 (yes).
 - Directing: 2 (yes).
 - Lecturing: 4 (no).
 - Training: 2 (yes).
 - Monitoring: 4 (no).

It seems that the DKMs are less leading than the GMs (which is not surprising). What was less expected was to find that the DKMs are also less lecturing and less monitoring than the GMs.

- How are you performing KM?
 - As specified in the knowledge handbook: 2 (yes).
 - As you interpret the KM directive: 3 (partial).
 - Relying on experts: 4 (no).
 - Intuitively: 2 (yes).

As expected, the DKMs are more positive than the GMs in stating that they are relying on the handbook as a source; and more reserved than the GMs regarding their interpretation of the handbook. Regarding experts, their view matched the one of the GMs.

- When are you performing KM?
 - In case of crisis: 4 (no).
 - To advert danger: 2 (yes).
 - Connected to events: 3 (partial).
 - Regardless of occasion: 2 (yes).

Here too, the DKMs feel less free than the GMs to apply KM not as specified in the handbook, typically in a crisis case or to avert danger.

¹ Between 'yes' and 'very much'.

The question on the business situation was generally answered as satisfactory. The affect of the situation was claimed to be negative and not partially positive, as it was for the GMs. The affect of a bad business situation was in both cases answered negative as well.

The DKMs have generally responded in a less positive way than the GMs, and for none of the factor the average answer was more positive than 2.23 (between yes and partial). There is also a clear minority of a VERY MUCH answer (mode 1). The exceptions are:

- Dependence on the GM.
- Interdependence with other activities.
- The importance of the managerial position of the DKM.
- KM being communicated at all levels of personnel.
- KM being performed though not called that way.

6.2.2 Based on the researcher's observations

"Table shells' are to be used for the identification of the data being sought, for ensuring parallel information gathering from the various sites, and for aiding in interpreting the data collected" (Miles and Huberman, 1994). The author, also being the director of knowledge for the company, is guiding, following and monitoring the implementation of the programme in the various divisions and the HQ organizations. Along this operation, notes were taken in a structured way called 'table shells', shown as an example for division A in table 6-8. By the time this thesis is being written, there are about 230 entries in the whole 'table shells' collected over two years, and about 60 of them for the five chosen divisions (appendix 13). The following factors were considered for the GM and the DKM:

- Long term values.
- Management support.
- Perception of relevance.
- Quality of performance of the programme.
- Initiative.
- Division's self-perception.
- DKM profile.

The division's factors considered were:

- Business results.
- Specific knowledge.
- Organization.
- Sharing practice.
- Openness to lessons learned.
- Innovation practice.
- Documentation practice.
- Reuse practice.

Factor		Issue	A
The division GM			
Long term values		To increase innovation , improve NPI implementation, and standing to CMMI standards	Nomination of people in charge of all functions.
Management support	Management support	How is the division's GM supporting the programme and how does he show it?	
	Management support	Is there a practice of recognition and how is it used to enhance KM activity?	
	Corporate demand	The attitude of the GM to corporate demand	Tries his best to be 'best in class'.
Perception of relevance		Perception of relevance: How is KM looked upon as a competitive advantage enabler?	Capturing knowledge from retiring employees.
Quality of performance of the programme	KM organization	How is the organization of KM leaders in the various directorates helping the KM programme?	Steering committee nominated at the division level.
	Programme monitoring	Is there a monitoring process for the KM programme and how is its rate and intensity established?	Asks for monthly progress report.
Initiative	Connection to agenda	Connection to agenda: How are the operational and business division's agenda, driving the KM programme by prioritising its activities?	
Division self perception	Consideration of division as self contained	Openness to external experts and to cooperation with other divisions; willingness to lead communities of practice	Openness within the group but not to divisions in other groups.
The division knowledge manager			
Perception of relevance		Choice of throughput or business result measures	None
Quality of performance of the programme	Programme performance	Procedures chosen to be implemented	Content management; technological database; project knowledge; sharing knowledge through the IAI-Net.
	Programme communication	KM communication	Lectures to T1000
DKM profile	Personal and professional profile	What is the knowledge manager's personal and professional profile and how does it help him perform?	Deputy director for engineering
	Position in organization	Member of the management staff	T1000 yet member of the division's management staff.
	Enabler for career building	Consideration of KM implementation as criteria for promotion	KM considered as part of task as promoter of working methods for engineering.
	Are other activities complementary	QM, HR, Change champion, Engineering, R&D, IT?	QM, change and IT
Initiative	Initiative	How does the knowledge manager apply creatively the KM programme?	Organizing a Kaizen event for KM implementation.

Factor		Issue	A
	Resource allocation	How is time allocated by the knowledge manager for the KM programme?	20% of his time on a regular basis.
The division			
Division's business results		What was the division's general business situation during the evaluation period and how could this affect the implementation of the KM programme?	Generally busy and creating a load problem for the DKM.
Specific knowledge		Is there awareness for company-specific and product-specific knowledge within the division, are these cultivated, and how is it used to enhance the division's intellectual property?	Yes in the view of the DKM.
Division's Organisation		Competence centres position: Is the division's organisation, within the overall matrix arrangement, mainly project oriented or technology proficiency oriented and how does it influence the knowledge sharing potential and the value of the intellectual property?	Mostly technology proficiency oriented to support projects of the group.
Sharing practice		Sharing practices: How does the division generates routinely good practices for the benefit of the whole company?	Pride in telling what it does best.
		How does the division practice inside and outside sharing ?	Would rather not share outside the division and definitely outside the group.
Openness to lessons learned		How are lessons learned from the KM process gathered, shared and used across the division?	The DKM organised a Kaizen event in order to improve the publication and distribution of lessons learned.
Innovation practice		How does the division promote a culture of innovation ?	
Documentation practice		Documentation practice: Are documenting in an organized way, enabling it to be reused and shared, encrusted in everyday work processes?	Implementing an Intellectual Property data/base mainly for design in SW and electronics.
Reuse practice		Reusing practice: How does the division practice inside and outside reusing?	

Table 6-8: 'Table shells' for division A

Taking the sharing practices issue: 'How does the division generates routinely good practices for the benefit of the whole company?' answered at A as 'Pride in telling what it does best' shows that the author has attempted to use objective evidence (in this case A's GM has presented in numerous cases to other divisions work methods established at A). Many of the comments have to be

read in contrast of the other divisions (see appendix 13), in as much as they are showing a difference in the typical pattern.

6.2.3 Based on the PDM

Activity around the PDM is continuous and has been performed for KM at IAI for the two years of the evaluation (and in fact continues until today). It is being planned on a yearly basis, reviewed by the DoK on a quarterly basis, and monitored by the DKMs on a monthly basis (for details refer to section 4.5). The PDM being a management tool used to plan and monitor the performance of the KM programme, one could use it to get insight about some of the factors enabling this implementation. The author has taken the actions in the PDM for the chosen divisions and has correlated them with the following factors:

- Perception of relevance.
- Initiative.
- Quality of performance of the programme.
- Division's self-perception.

The significance those factors take when being applied to the various division realities as they are translated to actions is the result of this comparison which gives an additional dimension to the factors shown in table 6-9:

Actions in Division	Perception of relevance	Initiative	Quality of performance of the programme	Division's self-perception
A	Capturing knowledge from retiring employees	Designing a method for the distribution of lessons learned	Conducting meetings with the T1000 level to communicate the programme	Updating the engineering intellectual property database
J	Building a new site for one of the division's directorates	Leading the establishment of a multi-divisional community of practice	Convening a team of knowledge leaders in the division	Demonstrating the operation of an innovative new line of business
N	Developing engineering handbooks for the whole company's benefit	Developing a tool for the capture of project knowledge	Convening a team of knowledge leaders in the division	Identifying and distributing good practices
S	Two KM procedures appear in the division's PDM as supportive of the division's objectives	Effort to implement a tool for the processing of the lessons learned in order to surface insight from them	Concentrating on one procedure at the expense of implementing a comprehensive programme	Using lessons learned to minimize rework in maintenance activity
U	Effort to implement the usage of a unified tool for the generation of proposals	Establishing two 'yellow pages' type sites for the whole company's benefit	Sacrificing the comprehensive implementation of the programme to enhance the lessons learned procedure and failing	The 'yellow pages' sites event prove the perception of the division as part of the whole company

Table 6-9: Actions in the PDM

6.2.4 Based on the mutual assessment results

The maturity of KM implementation is being assessed through a mutual assessment process, as described in section 4.6. The author has investigated the matrix of questions used for that purpose and has looked for their correlation with the following success factors:

- Long term values
- Management support
- Relevance to performance
- Quality of performance

Each of the assessing questions has been related to one of the factors (see appendix 8). Table 6-10 shows the distribution of assessment questions related to the factors at the different levels of assessment:

Factor/Level	Awareness	Training	Understanding	Commitment	Habit
Long term values	3	1	2	0	6
Management support	1	2	2	2	0
Relevance to performance	2	1	4	10	7
Quality of performance	6	8	4	2	1

Table 6-10: Distribution of factor's effect on assessment questions

The researcher was the designer of the assessment matrix; yet with the perspective of the research, the following remarks and self criticism seem appropriate:

- It is surprising to find three questions about long term values already at the awareness stage of the implementation. On the other hand, having 6 of such questions at the habit stage is appropriate.
- By the same token, having a majority of questions (eight) dealing about quality of performance at the training stage is very well timed.
- One would in fact expect that at the awareness level of the implementation, the effect of management support should be enhanced (only one question), at the expense of the quality of performance of the programme (six questions), which would be more appropriate at a much latter stage).
- Finally, relevance to performance which is the rationale for the very establishment of the programme needs to be better distributed at all stages.

6.3 Chapter overview

Having started with a multitude of factors taken from the literature, the author has used his management experience and specifically in the implementation of change and the result was a preliminary list of factors. Those factors were identified with regard of their dependency and categorized as affecting any of the four roles involved with the implementation of knowledge management.

The next step was to combine these factors into groups which were analyzed and attributed to the GMs and/or to the DKMs.

The author then exposed the proposed factors in relation to the four sources of information for the research, namely, the questionnaires, the researcher's personal observations, the PDM, and the mutual assessment. The result is a list of factors that will be used in the next chapter where the analysis of the results will be conducted. These are:

- Long term values.
- Management support.
- Perception of relevance.
- Division self-perception (relevant only to the GM).
- Quality of performance.
- Profile (relevant only to the DKM).
- Initiative.

7 Analysis of the Results

The more one analyses people, the more all reasons for analysis disappear. Sooner or latter one comes to that dreadful universal thing called human nature. (Oscar Wilde)

The author has taken the factors generated in chapter 6 and used them to drive the design of questionnaires, posted to each of the 23 GMs and 23 DKMs (one each per division of IAI). The author has taken the answers gathered from the GM and from the DKM questionnaires and has drawn a GM and a DKM pattern respectively. The questions were originally coupled with factors¹, which are now coupled with the answers. A choice of answers consisting mainly of opinions different than the average, create the division exploratory pattern. Interviews were then conducted with each GM together with their DKM. Through 'transparent conversation', a collection of indicative candid quotes² of the participants has been generated. In parallel, the author's observations were captured through a diary analysis. The observations, interview analysis and division exoloratory pattern were all brought together to create a pattern of behavioural factors for the division. This activity was done five times, once for each division selected for analysis.

The author is using an upward arrow (↑) to indicate a generally positive response with regard to the specific factor and its potential positive influence on the implementation of KM, whereas a downward arrow (↓) indicates a generally negative response with regard to the specific factor and its potential negative influence on the implementation of KM.

The author then turns to the other sources of information to focus on understanding the performance of each division, namely to the PDM and to the M/A results for each of the two years of the evaluation. Each is analysed according to their defined parameters (for details, refer to sections 4.5 and 4.6) and again appraised and marked with the arrows mentioned above as a PDM and an M/A pattern. The combination of these patterns is then presented as a pattern of performance for the division.

Combining the pattern of behavioural factors with the pattern of performance creates an analysis per division which refers to the factors (shown in bold) but to the results as well. In essence, the author at this point is taking data from all his sources, analyses it, and arrives at conclusions which are based upon the factors backed by their definition in section 6.1.4.1 to 6.1.4.7.

All this is being done per division for the five chosen divisions. The author then triangulates the analyses of the five divisions and the result is emerging as a pattern of proposed conclusions, from which the author suggests a winning combination of factors for the DKM. This result is then validated using two additional divisions to become the final conclusions of the research. The whole

¹ Looking at the GM questionnaire attached as appendix 10, one should be aware of the fact that the column referring to the related factor was not part of the document handed to the GMs. They are brought there for the benefit of the reader since they have been used as instruments for the analysis.

² And relevant to one of the three subjects handed over for discussion to the respondents ahead of the interview.

process, in which the factors are being conclusions that the author would use the data to support, is shown in figure 7-1.

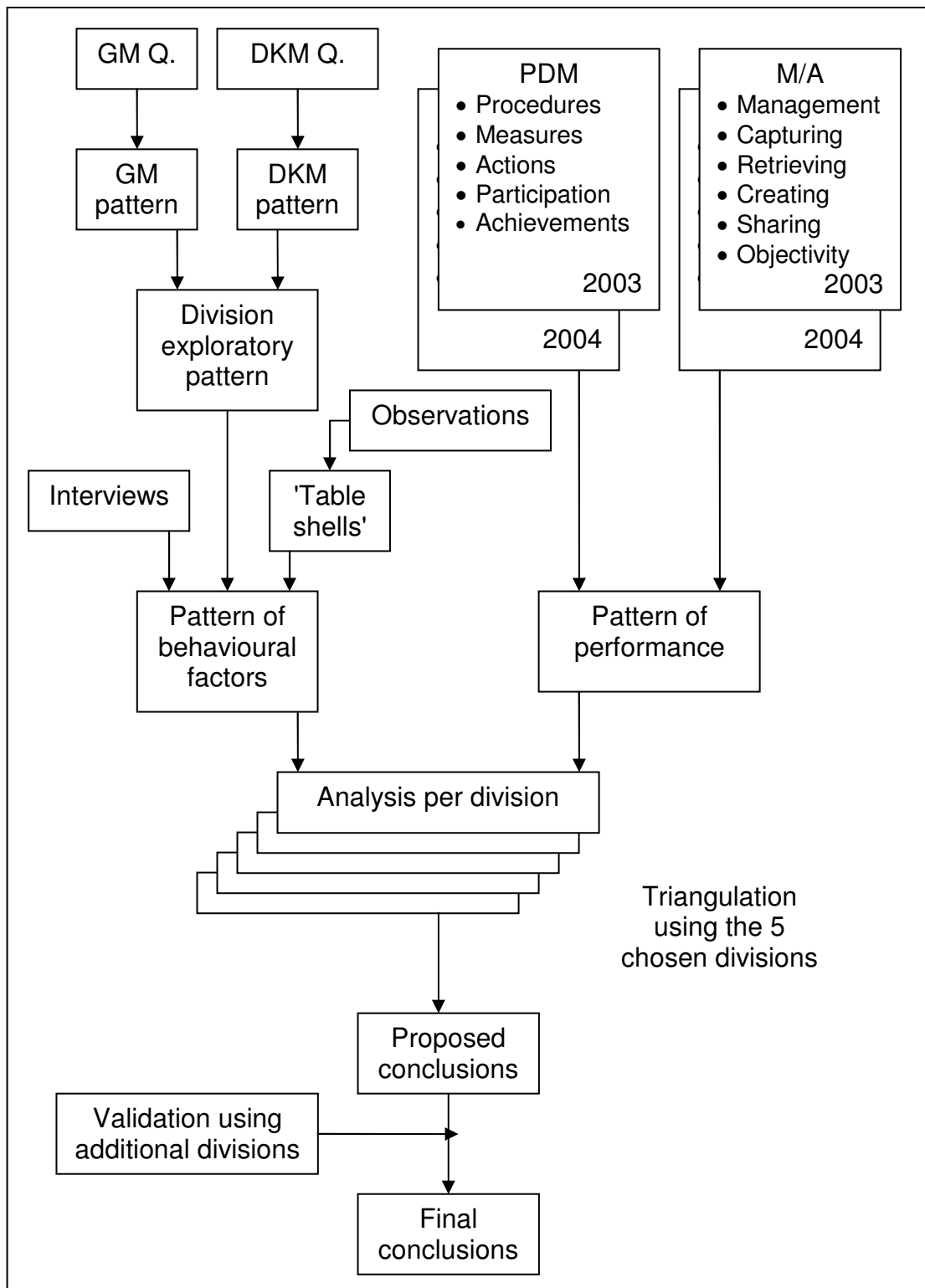


Figure 7-1: Analysis process

7.1 Research per division

The process described above will be repeated for each of the five divisions chosen as case studies for the research (the reader should refer to section 5.1 for the description of the division choosing process).

The type of arrow used in the GM or DKM pattern, is specified by comparing the average of the respondent to questions relating to the appropriate factor, compared to the average of all respondents to questions of the same kind.

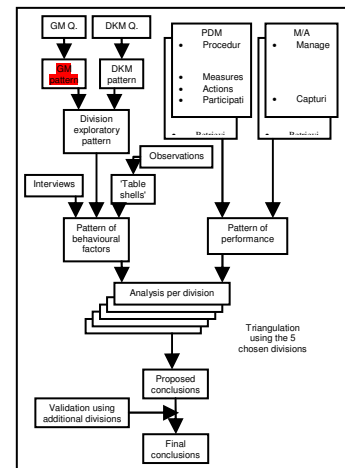
The issue of the candidness of the respondents to the questionnaire was mentioned in section 6.2.1, and there is no reason to doubt it. On the other hand, one cannot be sure about the accuracy of their answers, and therefore the author is relying on triangulating the results of the divisions.

7.1.1 Division A

The analysis of the results for the division starts with the information gathered from the questionnaires as they appear in appendix 10 for the GMs and in appendix 11 for the DKMs.

7.1.1.1 GM pattern

The author has used the distribution of GM questions by factors¹ presented in table 6-6 to evaluate and comment upon the answers of the GM of division A. For example, his average answer to questions relating to long term values was 2 while the average of all GMs was 1.67 (and therefore the arrow is downward ↓); and his average answer to questions relating to division's self-perception was 2.7 while the average of all GMs was 2.89 (and therefore the arrow is upward ↑). The result, showing mainly positions different than the other GMs average, appears in table 7-1:



Factors	Why	What	How	When
Long term values  	To improve the new product introduction process and the ability of standing up to CMMI standards; only partially as a promoter of innovation.	Considers it his task to establish a culture of continuous learning and an environment of sharing; only partially considers it his task to promote the division to a leading process knowledge position.	Active in improving processes through process analysis; advocates sharing other's good practice and sharing own good practices with others; only partially trusts KM to improve internal collaboration.	

¹ For details on the factors see section 6.1.4.

Factors	Why	What	How	When
Management support  	Because top corporate management recognizes and supports knowledge management efforts; partially dependent on corporate for KM performance.		Supports and showing it; recognizes doers and increases employees' empowerment.	Only partially acknowledge participation in KM events.
Perception of relevance  	To identify experts; to save costs; because the business situation was positive and it affected KM positively.	Awareness for division-specific and product-specific knowledge within the division; no incentives.	Admits that the actual practice isn't totally congruent with KM.	
Division self-perception  		Open to external sources of knowledge.	Open to external experts for KM implementation.	
Quality of performance  	Exclusivity of the DKM not necessary; only partially applicable to non-managerial levels and to non-technical activity.	Planning for the KM infrastructure is partial.	Not relying on the KM organization under the DKM.	Capturing knowledge from retiring employees.
Initiative  		Direction of collaboration activities for the purpose of knowledge creation is partial; yet proud about KM accomplishment and communicates its results.	Uses human mobility as a mean of transferring knowledge; meetings are the vehicle for knowledge transfer.	Doesn't deny a role to KM in emergency cases and other operational activities.

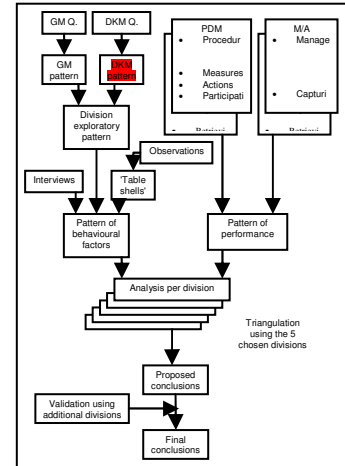
Table 7-1: Division A - GM behavioural pattern

One can note that the GM in this division appears to be more reserved than others regarding statements about the long term values of KM; he sees the practical values of KM and initiated the process of capturing knowledge from retiring employees; he feels dependent on corporate support but his own support is average though he is proud about their achievements; he considers KM to be applicable mostly at the technical managerial levels; he doesn't require the DKM to be employed full time on the subject and doesn't limit him to

non-operational activities; and he attributes the division's achievements in implementation to its successful business situation.

7.1.1.2 DKM pattern

The author has used the distribution of DKM questions by factors presented in table 6-7 to evaluate and comment upon the answers of the DKM of division A. For example, his average answer to questions relating to profile was 2.63 while the average of all DKMs was 2.51 (and therefore the arrow is downward ↓); and his average answer to questions relating to initiative was 2.3 while the average of all DKMs was 2.43 (and therefore the arrow is upward ↑). The result, showing mainly positions different than the other DKMs average, appears in table 7-2:



Factors	Why	What	How	When
Long term values  ↓	Not to increase innovation, to improve staff retention or to deliver goods or services; reserved about the potential toward NPI or CMMI; yet believes in its virtues.			
Management support  ↑	Partially perceived as required by GM as ROI.		The GM is actively supporting the KM programme and he shows it.	Sometimes asks the GM to take active part in KM events.
Perception of relevance  ↓	Likely to affect quality.	Believes incentives could help; aims for the impact of KM on business results.		Doesn't consider KM appropriate for short term, or urgent activities and therefore doesn't look for recognition for successful projects; complains that the DKM is relevant mainly ahead of corporate reviews.

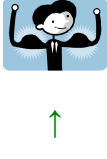
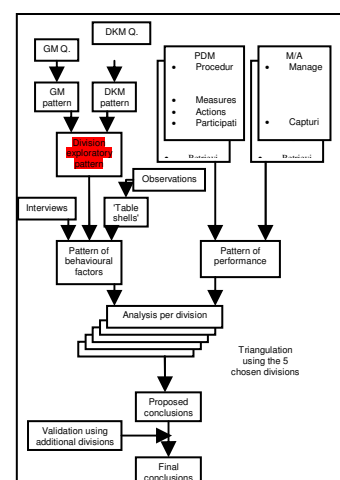
Factors	Why	What	How	When
Quality of performance 	Organization rather horizontal since mainly technology proficiency oriented; affected by lack of time due to intensive business activity.	Not active at establishing CoPs; trusts the project channel for the creation of new knowledge.	Not necessarily advocating sharing good practices with others; admits that the actual practice isn't totally congruent with KM; uses the IAI-Net for formal internal publishing.	
Profile 	Only partially dependent on the GM; doesn't believe the DKM must be exclusively dealing with KM; denies connection to HR.	Partially proud at division's KM achievements.	Denies using external experts for KM implementation; satisfied of the KM organization under him.	Not crucial to be part of the management staff.
Initiative 		Encouraging knowledge acquisition by soliciting knowledge from external sources.	Active in improving processes through process analysis; consider KM only as a recommendation.	

Table 7-2: Division A - DKM behavioural pattern

One can note that the DKM in this division is quite practical and doesn't tend to rely on KM for long term values (not active at establishing CoPs but trusting the project knowledge channel), yet he doesn't rely on KM for short term activities; he believes KM is required by the GM (mainly due to corporate requirements – "the DKM is relevant mainly ahead of corporate reviews") and looks for the impact of KM on business results though he feels only partially dependent on the GM; he trusts KM to affect quality; he is proud of their achievements, yet realistic that the actual activity isn't necessarily congruent to KM ("considered only as a recommendation").

7.1.1.3 Division exploratory pattern

Synthesising information gained from the GM and the DKM patterns, the author developed an integrated picture of the behavioural factors relevant to division A. Labelling these with the positive/negative arrow next to the icon signals the general impact the factor would have on KM implementation as related to the given factor:





1. Division's main business, situation and self-perception

Division A integrates engineering, logistics and production capabilities and facilities, to enhance the competitive advantage of the group of divisions it belongs to. The other divisions in the group are responsible for specific product lines.

1.1 Dependence on other divisions

The division is therefore totally dependent on the other divisions of the group and performs almost totally on their behalf. This is actually a case of interdependency whilst the system divisions are of course unable to supply their products without the deep involvement of the A division.

1.2 Horizontal versus vertical organization

The division is organised in a horizontal (process oriented) organisation - a fact that could help the knowledge sharing potential and the value of the intellectual property.

1.3 Awareness for division-specific or product-specific knowledge

There is awareness for division-specific and product-specific knowledge within the division, these are cultivated, and are used to enhance the division's intellectual property.

1.4 Openness to knowledge from external sources

Both the GM as well as the knowledge manager state that they practice knowledge acquisition by soliciting knowledge from external sources (such as advice/perceptions from customers, suppliers, or consultants, or by reviewing professional literature). Both would include suppliers or customers in internal meetings to gather a different perception than the one of the division. This shows an attitude open to influence and cooperation.

1.5 Openness to using external experts

The knowledge manager also states he doesn't object relying on experts external to the division, but only for KM technological implementation.

1.6 The business situation and its effect on KM performance

Both the GM as well as the knowledge manager appraised the division's general business situation as generally satisfactory during the evaluation period. Yet, while the GM estimated this to be a positive factor (maybe because they had enough activity to base it on), the knowledge manager thought it had a negative effect (probably because he realized he couldn't find enough time for it).



2. The profile of the division's knowledge manager

2.1 Managerial level

The knowledge manager belongs to the T1000 level.

2.2 Position

He is the deputy director for engineering of the division.

2.3 Seniority

He is very senior in the division and has already been in various management positions. He was appointed ever since the beginning of the programme in August 2002.

2.4 Importance attributed to the managerial level

The knowledge manager doesn't believe it is crucial for the knowledge manager to be part of the management staff of the division, or that the managerial position of people leading it is as important as most knowledge managers do.

2.5 Importance attributed to seniority

He doesn't totally deny the possibility for the position to be filled with a young person new to the company.

2.6 Importance attributed to publicity

The knowledge manager denied being influenced by the publication of KM results. He is also relating to the IAI-Net, one of the publication tools, in a quite minor way and regards it as a site used, and only partially, for formal internal publishing (such as posting directives, lessons learned/best practices to be used).

2.7 Exclusivity in dealing with KM

He also doesn't believe that KM has to be led by people dedicated only to KM.

2.8 Relationship to other tasks

The knowledge manager is mostly engaged in the implementation of processes within the engineering directorate and notes that this could be more influenced by his KM activity than KM being influenced by it. He nevertheless finds a strong relationship between KM and QM or with IT, but denies any with HR.

2.9 Pride for KM

The knowledge manager takes pride at the division's KM accomplishments and is ready to lecture about it to others.

2.10 Ambition to promote the division to a leading position in process knowledge

He considers the promotion of the division to a leading position in the process knowledge within the company one of his goals and is backed in this by the GM.



3. Attitude to long term values



3.1 KM as an enabler of long term values

The knowledge manager doesn't consider KM as an enabler to increase innovation, to enhance the division's ability to develop and deliver knowledge-based goods or services, or to improve staff attraction and retention.

3.2 KM as an enabler of short term values

He also attributes KM only the partial capability to improve the new product introduction (NPI) process, or to improve the division's ability to standing up to the CMMI standards.

3.3 Culture as a management task

The GM believes much less than the others that it is his task to establish a culture of continuous learning, or an environment of sharing in the division. He is also sceptical about KM's ability to improve internal collaboration within the organization. Nevertheless, he as well as the knowledge manager, trusts in general the virtues attributed to KM.



4. The relationship with management



4.1 Dependence on the GM

The knowledge manager states he is only partially dependent on the GM for the performance of KM (as opposed to most knowledge managers). He is also only partially influenced by the GM recognizing and supporting KM efforts.

4.2 GM's dependence on corporate

The GM admits he is partially dependent on corporate for the performance of KM and that KM is related to other corporate activity performed in the division.

4.3 Pride for KM

The GM takes pride at the division's KM accomplishments (such as lecture about it outside the division).

4.4 GM's recognition that KM is part of his success criteria

He also considers the criteria for measuring success to be partially based on the organization's mission, objectives, and goals and views KM as being part of them (the knowledge manager disagree with this stand).

4.5 Knowledge manager's empowerment by the GM

Both the knowledge manager as well as the GM, agree that the GM is empowering the knowledge manager he has appointed with the responsibility and authorization, authority and resources to enforce the KM programme in the division.

4.6 GM's explicit support

The GM states he shows his support explicitly and this was corroborated by the knowledge manager. Nevertheless, the GM admits taking only a seldom active part in KM events (not only as an invited manager).

4.7 GM's recognition of doers

The knowledge manager would like the GM to openly recognise doers (though the GM claims he does it).



5. The perception of relevance KM has with the division's performance

5.1 KM as an enabler for improved capability

The GM is more sceptical than others in attributing to KM credit for improving learning/ adaptation capability, employee skills, enabling better decision making, or a faster response to key business issues. He is also more sceptical in considering KM aligned with business strategies (such as developing intellectual asset tactics and strategy to support business strategy, relate intellectual property to business use, focusing the KM vision and practice to support and align with). On the other hand he trusts more than others KM to help in the identity of experts in a subject matter.

5.2 KM as an enabler for improved performance

The knowledge manager views KM as an enabler for enhancing product or service quality, or for saving costs.

5.3 Using incentives to promote KM

The knowledge manager (as opposed to the GM), believes incentives can help motivate employees to perform KM (such as aligning rewards and performance evaluation with KM, spotlighting top players and not necessarily material).

5.4 The validity of return on investment on KM

The GM is expecting for a return on investment of KM efforts in terms of results measures. The knowledge manager doesn't believe it would be readily available

and he actually didn't choose any business result measures either in 2003 or in 2004.

5.5 The applicability of KM below the management level

The knowledge manager believes KM applies to all levels of employees; he also doesn't believe it is applicable only to management. The GM is taking less a stand than others on these issues.

5.6 Knowledge managers as participants in short term activities

They both see a role (even if partial) to the knowledge managers or leaders in a case of emergency (and they don't consider their task too remote and long term for this). As opposed to most others, the GM sees a role (even if partially) to the knowledge managers or leaders in a case of emergency even up to including them at 'standing morning meetings'¹ (and doesn't consider their task too remote and long term).

5.7 Using throughput measures to 'sell' KM to personnel

The knowledge manager doesn't believe that using throughput measures would help him in 'selling' the programme to people who have to implement it.

5.8 Using business result measures to 'sell' KM to management

The knowledge manager also doesn't believe that using business results measures would help him in 'selling' the programme to management.

6. The level of initiative on the part of the knowledge manager ↑



6.1 Time allocated to KM

The knowledge manager states he allocates 20% of his time to KM on a regular basis.

6.2 Consideration of KM as a recommendation only

He nevertheless claims to consider KM as a recommendation only.

6.3 Securing sponsorship

He is not so active in securing sponsorship (such as obtaining management buy-in, making sure management understands and is ready to promote KM).

6.4 Creative contributions to the programme

He has initiated a system to gather the existing engineering knowledge and is generally active measuring knowledge resources (such as knowing what the organization already knows, creating and cataloguing the organisation's memory, performing knowledge audits). To hasten the implementation of the management of lessons learned, he organised a Kaizen event meant to analyse the process and detail it so that it would be readily implemented. To ensure the transfer of critical knowledge he has instituted a process that takes care of retiring employees long enough before their retirement.



7. The programme performance ↑

7.1 Belief KM has been performed without calling it as such.

Unlike others, the knowledge manager is not so sure his division has always been performing KM without calling it as such.

7.2 Organising for KM

¹ Short staff meetings meant to put everybody on common ground on a specific single issue (got its name from meetings where the night shift updates the day shift).

Contrary to most knowledge managers, he has managed to establish a KM organisation beyond his appointment and he is satisfied with the way it functions (the GM was less satisfied with their performance).

7.3 Activity in performing KM

The knowledge manager denied being active in establishing and leading multi-divisional communities of practice. He also declared playing only a minor role in establishing and leading competence centres, or encouraging employees to participate in them. He believes new knowledge is generated mainly from the project activity. He would rather advocate sharing other's good practices than sharing the division's good practices with others.

The GM believes in using human mobility as a mean of transferring knowledge. He relies on meetings to transfer knowledge all the way through the hierarchy ladder; though by this he doesn't build a knowledge data base to the organisation.

7.4 Communicating KM

Lectures about values as sharing, innovation, or reuse are given in the division and the knowledge manager is joining in communicating the programme and lecturing about it. The GM also explains KM to employees (such as communicating the results of activities, making the concepts real, using successful practices as examples, demonstrating the individual and group value of shared knowledge).

7.5 Monitoring KM

There is a monitoring process established in the division for the KM programme meant to assess the impact KM performance has on operational or business results and claimed to be partially adaptive to them and with partial involvement of the GM.

7.1.1.4 Interviews as a reinforcement to the exploratory phase

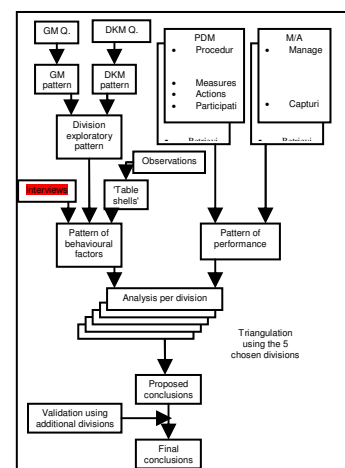
The GM and the knowledge manager of the division (DKM) were notified in advance of the intention to conduct a three-party meeting (with the researcher), with the purpose of discussing three topics:

- The relation of their KM programme to the division's core interest and to what constitutes their focal business goal.
- The process by which the KM programme is being managed and monitored in the division.
- Responsibility and authority of the knowledge manager.

The interview was conducted five months after A's GM and DKM had filled the questionnaires. Referring to the three topics handed over for discussion to the respondents ahead of the interview, there is a list of indicative quotes they made:

Linking KM to business

GM (the general manager of the division): "KM can improve ways of working across the division and achieve short term advantages".



DKM (the knowledge manager): "It would even suffice if we improved project by project through KM" (lower expectation even than the GM's and let alone long term values).

GM: "We have established a method to back-up any employee expected to retire in two years, with a new and young employee, and they come-up with a tutoring plan covering all the knowledge critical to the division. This is possible when we are talking about 2-5 employees every year. We are bound to see in a few years much higher numbers and then it will be very difficult to deal with the problem".

The knowledge manager remarked that the solution to this is by documentation. "We have been involved with the establishment of a design data-base for a few years; not everybody is documenting their design but at least in the software and electronics disciplines it is being implemented".

GM: "The NPI process is dictating what, how, and when to document. This is the basics; what the knowledge manager is talking about is beyond this – it's the design consideration, the lessons learned and the experience."

Monitoring the programme

GM: "The knowledge manager being the deputy director of the engineering directorate, KM is mentioned as one of the actions (in the PDM) of this organisation. It is then monitored as others on a monthly basis." He agreed that it would get better visibility if it was part of the division's PDM. He would put it there if he was convinced of the immediate impact it could have on the performance of the division. He also admitted that the mutual assessment is very important to them and if this was graded, he would probably do it.

DKM: "We have established a steering committee comprising of the knowledge leaders of all directorates; we meet on a monthly basis and monitor the programme".

Authority/Responsibility of the knowledge manager

The knowledge manager considers himself fully supported by the GM.

GM: "As a deputy director, the knowledge manager belongs to the management staff of the division. He is then in contact with all other directors, is able to raise the issue at staff meeting and does so eventually".

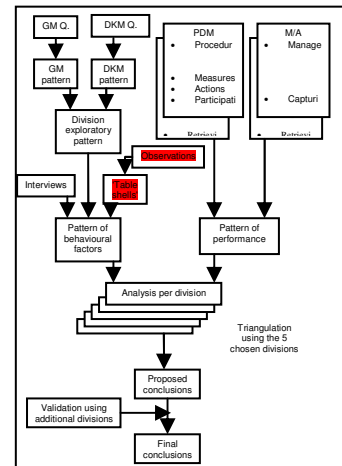
To summarise, the knowledge manager is very much minded of process knowledge. He looks at KM in a totally pragmatic way – a position that would be better applicable to the GM. This comes at a detriment to KM which is left with nobody in charge of its visionary aspect. In a meeting in 2001 meant to discuss the profile of knowledge managers, and in which the knowledge manager participated, he expressed the opinion that the DKM should be a 'project manager' with defined goals and resources. Nevertheless, the knowledge manager has managed to take the division to successful results in KM implementation.

7.1.1.5 Researcher's observations

The director of knowledge is in contact with the divisions' knowledge managers on a day-to-day basis, both on his initiative, to promote issues

which have been stagnant as reflected in the PDM follow-up, or on their initiative to resolve difficulties encountered in the implementation.

The divisions' GMs are considered as the customers of the programme. The director of knowledge meets them at least three times a year and hears their view on the programme and its implementation.



Date	Interacting party	Content
16.09.01	GM of A	Customer knowledge is prime information. Knowledge sharing is problematic due to internal competition. Reuse, only within department. Recognition to knowledge owners and not to sharers. Innovation only at the concept level. The rest is engineering.
18.10.01	VP of ABCDE group	Knowledge sharing between divisions based on personal acquaintanceship within professional circles.
30.07.03	GM of A	Establishment of steering committee at division level; division N took example and did the same.

The information the researcher has from observing the division closely, is captured in a diary (seen left is an extract). This is formatted into the 'table shells'. Further samples of diary observations are found in appendix 12, while the 'table shells' can be found in appendix 13.

7.1.1.6 Pattern of behavioural factors

The author has synthesised the arrow labels from the GM and DKM patterns, the information from the interview and the insights from the researcher's observations to derive the following integrated picture (shown in table 7-3) for the behavioural factors relevant to division A:

Factor	Pattern
Long term values	↓
Management support	↑
Perception of relevance	↓
Division self-perception	↑
Quality of performance	↑
Profile	↑
Initiative	↑

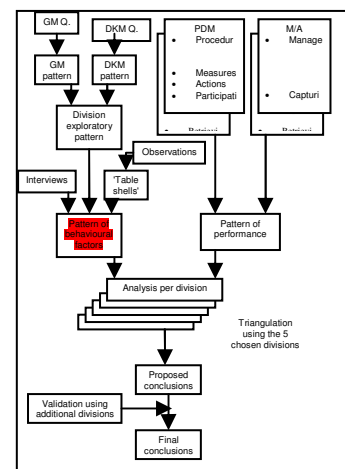


Table 7-3: Pattern of behavioural factors for division A

Long term values, management support, perception of relevance, profile, and initiative, seem self explanatory and for a positive pattern, one would expect a higher potential of implementation. Quality of performance as well has a positive logic, and the better the division is performing according to the KM handbook, the better are the chances of implementation.

The factor of the division's self-perception is the only one with a negative logic, in as much as the higher it is, the lower the expectancy for knowledge transfer and sharing is. The upward arrow here means the division doesn't have a high

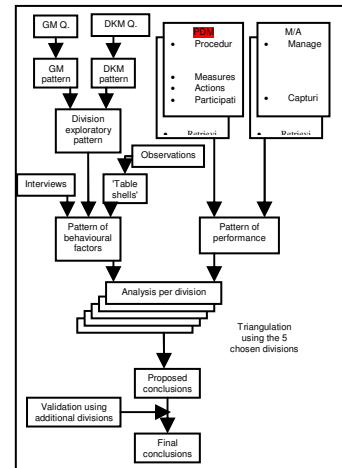
self-perception and therefore has a higher potential of KM implementation in general and of knowledge sharing particularly.

7.1.1.7 PDM pattern

A separate analysis of the divisions 'performance' is also undertaken.

PDM is one of the tools for the measurement of success (brought thereafter from appendix 6). The achievements associated with the progress of KM implementation have been defined by describing the conditions for the PDM to be successful as described in section 4.5.2.

The PDM outputs from each of 2003 and 2004 are analysed by success parameter (e.g. number of KM throughput of business result measures), creating a written description of the specific dimension of performance. The author then used an upward arrow (↑) to indicate a generally positive result and its being a positive indication of the implementation of KM, and a downward arrow (↓) to indicate a generally negative result and its being a negative indication of the implementation of KM.



Objective/Measure Matching	Measures	Basis	Target	Action/Measure Matching
<ul style="list-style-type: none"> Performance Result Performance Throughput Performance 				<ul style="list-style-type: none"> Performance Result Performance Throughput Performance
Knowledge sharing Knowledge creating Knowledge retrieving Knowledge capturing Awareness enhancement	Measures			Action for awareness Action for capturing Action for retrieving Action for creating Action for sharing
Legend: Full matching ● Partial matching ○	Objectives	Participants		Participant/Action Matching
		Directorate a Directorate b Directorate c Directorate d Directorate e		

1. KM procedures (2003)

A's knowledge manager dealt in 2003 with all the four phases of the KM life-cycle on top of enhancing the awareness for it. The chosen procedures were:

- Capturing engineering and production knowledge
- Managing the knowledge from lessons learned
- Knowledge extracted from the project process
- Communities of practice

2. KM measures (2003)



Measures and goals not always matched with procedures:

Participants in the implementation of processes (performance measure): 70%

Training engineering personnel for documenting intellectual property (performance measure): 70% of personnel

Number of items documented as intellectual property (performance measure): 20

Organisation of a generic and hierarchical document tree (performance measure): 1

Number of debriefings performed (performance measure): 12

Reuse in electronic design (throughput measure): 30%

Reuse in software design (throughput measure): 85%

3. KM Actions and directorate participation to enable goal achievements (2003)

Actions not always matched with measures:



Implementation of engineering processes

Engineering information management definition

Intellectual property database establishment

Organisation of a generic and hierarchical document tree

Definition and implementation of generated lessons learned

Capturing and managing production knowledge for price proposals

Establishment and management of communities of practice

Actions were attributed to the knowledge leaders nominated in all directorates.



4. Achievements of goals (2003)

The KM programme was not quite monitored in 2003 so for most of the goals there is no reliable information on their achievements. The only exceptions are:

There was no detailed plan to train personnel so the performance in engineering and production was only partial.



Only software items were documented as intellectual property.



Reuse was not managed in a quantified way so that there is no records of achievements.



The project chosen to be the pilot for the organisation of a generic and hierarchical document tree was not cooperative enough.



5. KM procedures (2004)

In 2004, the Policy Deployment Model (PDM) has been updated in such way that only one procedure by KM phase could be chosen. A chose the following procedures:



Enhancing the awareness for the programme

Document management (from the capturing and documenting knowledge phase)

Establishing a technological knowledge base (from the retrieving knowledge for reuse phase)

Knowledge extracted from the project process (from the creating new knowledge phase)

Using the division IAI-Net portal to share knowledge (from the sharing knowledge phase).

6. KM measures (2004)

To these procedures it matched measures with goals:

Number of events dedicated to train T1000 management level about KM (performance measure): 8

Amount of technological knowledge allowed for sharing to the company (performance measure): 700

Amount of knowledge created along with the project development (performance measure): 8

Number of people using the division portal on a weekly basis (performance measure): 600

The document management procedure neither was measured, nor was an action attributed to it. ↓

The fact that the knowledge manager chose only performance measures is quite negative because it doesn't make any attempt to connect the KM programme with the operational or business goals of the division. ↓

7. KM actions and directorate participation to enable goal achievements (2004)

Conducting the meetings with the T1000 level

Update of the intellectual property database

Capturing and managing engineering and production knowledge for price proposals (allocated to the marketing directorate though it hadn't nominated a knowledge leader). ↓

Implementing content management by the 'Company Domain' approach (action not related to any measure). ↓

Creating a database of options accorded to the division by its various suppliers (action not related to any measure). ↓

Capturing knowledge from people about to retire

Concentrating the project's knowledge in a shared directory. ↑

Performing a Kaizen event on the subject of distribution of lessons learned (action not related to any measure). ↓

Managing the division's portal

In 2004, the knowledge manager distributed tasks among the knowledge leaders. ↑

8. Achievements of goals (2004)

The PDM system in 2004 enabled the knowledge managers to actually update their achievements along the year, according to their goals (which were also distributed on a monthly or quarterly basis):

Number of events dedicated to train T1000 management level about KM: 8

Amount of technological knowledge allowed for sharing to the company: 650 (this database is actually open only to people within the division). ↑ ↓

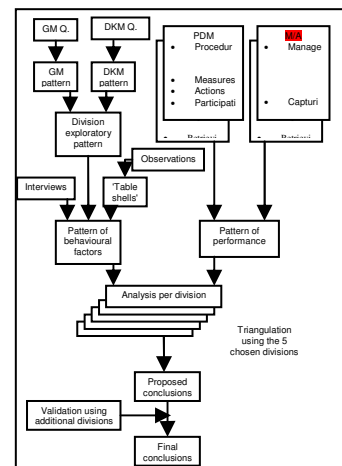
Amount of knowledge created along with the project development: 15 ↑
 Number of people using the division portal on a weekly basis: 504 ↓

The PDM performance for division A is:

	Success Parameter		A		Improvement		Pattern
			2003	2004	Av.	Lead/lag	
PDM	Number of KM procedures		5	5			
	Number of measures		7	4			↓
		Performance	5	4			↓
		Throughput	2	-			↓
		Business result	-	-			↓
	Achievement of goals		20%	50%			↑
	Number of actions		7	9			↑
	Follow up on actions		100%	100%			↑
	KM programme participation		4	3			↓

7.1.1.8 Mutual assessment pattern

The mutual assessment is conducted on a yearly basis by a team external to the division that includes IAI's director of knowledge, a knowledge manager from another division and one from the corporate organizations; the mutual assessment process takes a full day spent at the premises of the division examined; at the end, the results are negotiated with the division's management to reach a consensus. The division management purpose is to learn from the assessment in order to improve its implementation method and improve its results. The result is a numerical score, backed up by the mutual assessment team's reason for giving this score. (In the section below, both the score and some of the reasoning is presented). The mutual assessment results are also published on the IAI-Net and are another source of internal competition within the company to give it a catching effect.



The author is again using an upward arrow (↑) to indicate a generally positive result and its being a positive indication of the implementation of KM, whereas a downward arrow (↓) to indicate a generally negative result and its being a negative indication of the implementation of KM.

1. Self and Mutual assessment grade (2003)

Division A graded itself at 0.98 (regarding all phases). The mutual assessment grade was 0.71 divided as follows:

1.1 Managing and tracking of the programme (2003)

The management of A has appointed a committee of knowledge leaders representing all directorates ever since the beginning of the programme – 0.73 (higher than company's average). ↑

1.2 Capturing and documenting knowledge (2003)

In some of the disciplines of the engineering directorate, knowledge is captured in a routine way (though the method suggested by the KM handbook, starts with the designation of the critical knowledge that needs to be captured). Even this, is not performed in other disciplines or in other directorates – 0.70 (higher than company's average). ↑

1.3 Retrieving knowledge for reuse (2003)

The list of competence centres to be fostered has been updated. Retrieving engineering knowledge from the intellectual property database is enforced through design reviews – 1.25 (higher than company's average). ↑

1.4 Creating knowledge (2003)

Documenting new knowledge from projects is partially done – 0.6 (lower than company's average). ↓

1.5 Sharing knowledge (2003)

The division is participating in a few multi-divisional communities of practice, on top of some local ones. Some of the practices generated by the division are published as good practices – 1.67 (highest in the company). ↑

2 Objectivity – mutual over self assessment (2003)

The author is considering an objectivity factor of between 0.8 and 1.2 as sign of reality for the division assessing its own performance. This is definitely an advantage to whoever is interested in corrective action, as it positions the division in a closer position to where it should be. The objectivity factor, calculated to be 0.72, shows A to be a little bit over-confident. ↓

3 Self and Mutual assessment grade (2004)

Division A graded itself higher than in 2003 at 1.5. The mutual assessment grade was 1.47 divided as follows: ↑

3.1 Managing and tracking of the programme (2004)

The deputy directors of all directorates were nominated by the GM as knowledge leaders. Their KM work-plan is tied to the directorate operational work-plan – 2 (higher than company's average). ↑

3.2 Capturing and documenting knowledge (2004)

Each directorate specified a list of subjects to capture knowledge about and prioritised it – 1 (higher than company's average). ↑

3.3 Retrieving knowledge for reuse (2004)

A model for parametric cost was designed and it is used as a database for generating price proposals – 1 (higher than company's average). ↑

3.4 Creating knowledge (2004)

New project knowledge is being captured and gathered using the intellectual property data-base process. The division has established a forum for the 'sprouting' of innovative ideas. This process has generated so far some very beneficial ideas that are proposed across the group (five divisions) – 1 (higher than company's average). ↑

3.5 Sharing knowledge (2004)

Participation in communities of practice is growing (the division is leading one of them), and so is the generation of good practices – 1.3 (higher than company's average). ↑

4 Objectivity – mutual over self assessment (2004)

The objectivity factor, calculated to be 0.98, shows A has improved very much their self assessing capability and achieved an almost perfect level. ↑

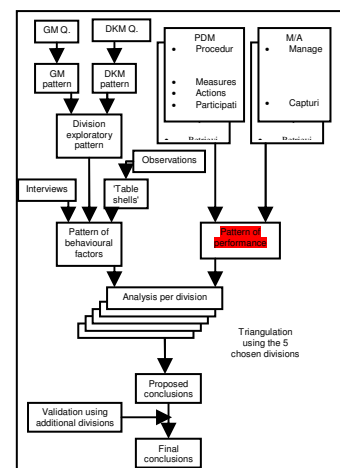
The M/A performance for division A is:

	Success Parameter		A		Improvement		Pattern
			2003	2004	Av.	Lead/lag	
M/A	Mutual assessment grade		0.71	1.47	2.11	98%	↓
		Managing and tracking of the programme	0.73	2	1.73	158%	↑
		Capturing knowledge	0.7	1	1.41	101%	↑
		Retrieving knowledge for reuse	1.25	1	1.02	78%	↓
		Creating knowledge	0.6	1	1.47	113%	↑
		Sharing knowledge	1.67	1.3	1.36	57%	↓

7.1.1.9 Pattern of performance

The pattern of performance is the sum of the PDM and M/A patterns. From the pattern of performance of the A division (shown in table 7-4), one can see a clear decrease of performance with regard to the PDM measures in as much as there are no longer throughput measures in 2004, and the number of functions participating in the programme decreased. On the other hand the number of actions increased, all of them were managed, and 50% of the goals were achieved. This could be a sign of the programme becoming more realistic – doing less but better.

The M/A section of the pattern of performance of the A division shows an overall improvement just slightly lower than the company's average, mainly restrained by the retrieving and the sharing parts.



	Success Parameter		A		Improvement		Pattern
			2003	2004	Av.	Lead/lag	
PDM	Number of KM procedures		5	5			
	Number of measures		7	4			↓
		Performance	5	4			↓
		Throughput	2	-			↓
		Business result	-	-			↓
	Achievement of goals		20%	50%			↑
	Number of actions		7	9			↑
	Follow up on actions		100%	100%			↑

	Success Parameter		A		Improvement		Pattern
			2003	2004	Av.	Lead/lag	
	KM programme participation		4	3			↓
M/A	Mutual assessment grade		0.71	1.47	2.11	98%	↓
		Managing and tracking of the programme	0.73	2	1.73	158%	↑
		Capturing knowledge	0.7	1	1.41	101%	↑
		Retrieving knowledge for reuse	1.25	1	1.02	78%	↓
		Creating knowledge	0.6	1	1.47	113%	↑
		Sharing knowledge	1.67	1.3	1.36	57%	↓

Table 7-4: Division A - Pattern of performance

7.1.1.10 Division analysis

Now the pattern of behavioural factors is brought together with the pattern of performance. The researcher describes a combined picture of both aspects of the division, highlighting their relationship with the proposed factors.

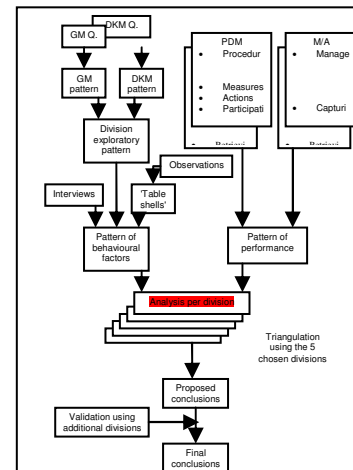
A is an organisation established to support the business oriented divisions of the group with the necessary engineering, production and logistics capabilities required to market their products. Its organisation is totally functional (not project oriented). Cooperation between it and the other group divisions is essential due to the interdependency existing between them. Cooperation internal to the division is dictated by the work configuration, well established by

Factor	Pattern
Long term values	↓
Management support	↑
Perception of relevance	↓
Division self-perception	↑
Quality of performance	↑
Profile	↑
Initiative	↑

now through its being performed by 'integrated product teams' (IPT), members of which come from the various directorates in the division.

A description of the division is generated from the pattern of behavioural factors and the pattern of performance while highlighting the factors it refers to.

For division A, the comparison of the achievement of goals between 2003 and 2004 shows some improvement, probably due to KM being familiar to more people across the division. The mutual assessment grade also improved (by 207%) though by less than the company's average (211%). A's knowledge manager was also more realistic in his assessment of his KM performance in 2004 than in 2003, and assessed his performance almost perfectly (0.98). The author will try now to explore the behavioural factors in A, hoping they will constitute at least a background if not a rationale to these results. Process knowledge is and has always been one of the 'fortes' of the division – it was one



Analysis of the Results

	Success Parameter		A		Improvement		Pattern
			2003	2004	Av.	Lead /lag	
PDM	Number of KM procedures		5	5			
	Number of measures		7	4			↓
		Performance	5	4			↓
		Throughput	2	-			↓
		Business result	-	-			↓
	Achievement of goals		20%	50%			↑
	Number of actions		7	9			↑
	Follow up on actions		100%	100%			↑
	KM programme participation		4	3			↓
M/A	Mutual assessment grade		0.71	1.47	2.11	98%	↓
		Managing and tracking of the programme	0.73	2	1.73	158%	↑
		Capturing knowledge	0.7	1	1.41	101%	↑
		Retrieving knowledge for reuse	1.25	1	1.02	78%	↓
		Creating knowledge	0.6	1	1.47	113%	↑
		Sharing knowledge	1.67	1.3	1.36	57%	↓

of the pioneers in the company for the 'Theory of constraints' implementation in production and the author¹ was even involved in its implementation for engineering; it was the cradle of the now well established 'New Product Introduction' (NPI) process, and it is now leading the company in the process of parametric pricing. A is much more open to external knowledge than it is to sharing its own with other

divisions outside the group and the flow management effort was performed with an outside consultant (**the division self-perception factor**²).



The GM of the division highly considers process knowledge (as opposed to his specific answer on the subject as it appears in section 7.1.1.1), and the knowledge manager, has always positioned himself in the focus of process activities. A has been very busy during the evaluation period (2003-2004) and as remarked by its GM this was beneficial to the division who had real work to develop and establish its process around. Such a background was probably very helpful for the implementation of the KM programme by the knowledge manager (**a division environment factor**³).

A's knowledge manager is in charge of processes in the engineering directorate. This puts him in a focal and advantageous position for his own organisation and with engineering usually leading production and logistics, also for the whole division. Being senior in the division and at the source of many activities emanating from the processes of the engineering directorate, he almost doesn't need the management status of belonging to the T300 level.

¹ The author was at the time, the deputy GM of a division, which evolved to be the group comprising of A and of its sister divisions.

² For each of the factors presented in bold, refer to their definition in section 6.1.4.1 to 6.1.4.7.

³ The author is referring to division environment as well as to the director of knowledge factors.

KM for him is an enabler to process knowledge, and process knowledge is a vehicle for promotion (**the profile factor**¹). He started back in 2003 with the organisation of project content management on a generic and hierarchical document tree much before this was part the KM programme. He wasn't very successful in the implementation but the intention shows an analytic approach coming from a process oriented mind² (**the initiative factor**).



The GM works very hard to accommodate corporate goals and targets. He regards KM to be one of them and part of his success criteria. He is also very successful in this and his attitude to process knowledge certainly helps him achieving it.



The knowledge manager demonstrates a more detached stance (**the profile factor**) when claiming he is only partially dependent on the GM for the implementation of KM (**the management support factor**).



Both the GM and the knowledge manager, have a sceptical attitude to KM playing an important role for **long term values**. They state they trust KM is good for them, but find it difficult to relate it to any specific value. The GM was also more sceptical than others in attributing to KM credit for improving learning or adaptation capability, employee skills, enabling better decision making, or a faster response to key business issues.



He was also more sceptical in considering KM aligned with business strategies. The knowledge manager attributed KM more tangible credits such as being an enabler for improving the NPI process, improving the division's ability to standing up to the CMMI standards and eventually, enhancing product or service quality, or for saving costs. Nevertheless he didn't take the initiative of choosing throughput measures which could help him relate KM to operational activities, or business result measures which would tie his KM achievements to some of the division's bottom lines (**the perception of relevance to division performance factor**).



Even his attitude to the creation of new knowledge, shows the knowledge manager to be more inclined toward the more tangible path of knowledge creation through the performance of projects and not through the less committed path of innovation (**the quality of performance of the programme factor**).



A's knowledge manager has taken during the two years of the evaluation period, a very methodical path to the implementation of the KM programme. Starting from the beginning he appointed knowledge leaders in the various directorates and allocated them with tasks complementing the KM programme but at the same time fitting the goals of their own organisation.

¹ The profile of the DKM of A is described according to its definition being 'the personal and professional background of the knowledge manager, his seniority, and his position in the organization'.

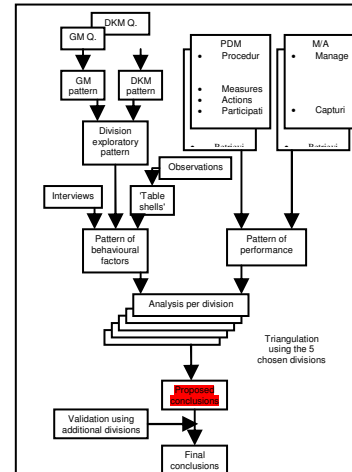
² As the interview information shows.

7.1.2 Divisions J, N, S, U

The other divisions were chosen as A and as described in section 5.1. Each of these divisions were analysed in the same manner as division A. The full analyses are presented in appendices 14, 15, 16, 17 (respectively).

7.1.3 Emerging pattern of proposed conclusions

The triangulation of the information from the pattern of behavioural factors, and the one from the pattern of performance from the five divisions chosen as case studies is shown in Table 7-5. The two sources of information for success¹ are indeed inter-related but they are not similar. While the PDM measures mainly management entities such as the number of procedures, measures, actions, or the number of directorates participating in the programme; it also refers to matters of content, such as the number of throughput or business results measures (see also section 4.5). In fact, even the so-called management entities drive to value and missing a procedure will create a phase of the KM life cycle not being managed.



The author has created a combined parameter for the PDM source of information, called PDM Overall (described in equation 7-1). It consists first of the yearly achievements of goals normalized to performed procedures for the first and the second years of evaluation, since this is really what the DKM is after; it then adds to it the contribution of choosing throughput or business result measures, again for the first and the second years of evaluation, since these are the measures connecting the KM programme with the business of the division:

$$\begin{aligned}
 \text{PDM Overall} = & \\
 & (\text{Achievements 2004} / \text{Procedures 2004}) \\
 & * (\text{Achievements 2003} / \text{Procedures 2003}) \\
 & + (\text{Throughput or business results 2004} / \text{Results 2004}) \\
 & + (\text{Throughput or business results 2003} / \text{Results 2003})
 \end{aligned}$$

Equation 7-1: Calculation of the PDM Overall parameter

This measure ranks divisions N and S at the top of the list, mainly due to their choice of throughput or business result measures (though S didn't even pick all the five necessary procedures in both years but compensated by using four out of its six measures as throughput or business result measures).

The mutual assessment on the other hand really measures the maturity of the implementation (as described in section 4.6), so that the product of the yearly M/A scores would show if and how much progress has been made along the two years of the evaluation:

¹ The reader is reminded of the working definition of success as it appears in section 5.2.2.

$$\text{M/A Overall} = \text{M/A 2004} * \text{M/A 2003}$$

Equation 7-2: Calculation of the M/A Overall parameter

This measure ranks divisions A and N at the top of the list since they both were above average on both years.

Factor-Success/Division			A	J	N	S	U
Factors	Long term values		↓	↓	↑	↓	↓
	Management support		↑	↓	↓	↑	↓
	Perception of relevance		↓	↑	↑	↑	↓
	Division self-perception ¹		↑	↓	↑	↓	↑
	Quality of performance		↑	↓	↑	↓	↓
	Profile ²		↑	↓	↑	↑	↑
	Initiative		↑	↑	↑	↑	↑
PDM ³	2003	Procedures 2003	5	5	5	4	7
		Measures 2003	7	5	5	5	7
		Throughput/business 2003	2	0	2	0	1
		Actions 2003	7	5	7	4	7
		Participation 2003	4	0	11	10	6
		Achievements 2003	0.2	0.5	0.5	0.25	0.25
	2004	Procedures 2004	5	5	5	3	4
		Measures 2004	4	5	5	6	4
		Throughput/business 2004	0	2	1	4	1
		Actions 2004	9	6	7	7	4
		Participation 2004	3	6	7	10	4
		Achievements 2004	0.5	0.8	0.8	1	0.5
	PDM Overall		0.29	0.42	0.62	0.69	0.40
M/A ⁴	2003	M/A 2003	0.71	0.49	0.66	0.3	0.54
		Objectivity 2003	0.72	0.45	0.57	1.43	1.13
	2004	M/A 2004	1.47	0.87	0.93	1.3	0.7
		Objectivity 2004	1	0.46	0.49	0.78	1.17
	M/A Overall		1.04	0.43	0.61	0.39	0.38
Total			1.33	0.84	1.23	1.08	0.78

Table 7-5: Factors and results for the case studies

¹ Applicable only to the GM.

² Applicable only to the DKM.

³ Values taken from the appropriate PDM pattern.

⁴ Values taken from the appropriate M/A pattern.

The total success score was taken as the sum of the PDM overall and the M/A overall.

$$\text{Total} = \text{PDM overall} + \text{M/A overall}$$

Equation 7-3: Calculation of the Total Success Score

The total score ranks the chosen divisions in the following order: A, N, S, J, U. The author urges caution when using such numerical analysis; the numbers are helpful to the researcher but are neither absolute nor complete; for example the PDM and M/A scores come from dissimilar scales.

The author has tried to differentiate between the levels of importance for the occurrence of factors in the implementation process and has labeled them as *sufficient*, *necessary*, or *supportive*.

A *sufficient* factor is one that when effective, it would create a very good chance of success, and no other factors are needed;

Necessary factors are important to the implementation; their absence puts success at risk, while their presence does not guarantee it. Necessary factors, if absent, could be replaced by other necessary factors.

While *supportive* factors do not have an effect on success if they are the only factor present in an implementation, they would increase the likelihood of success of an implementation that does have the necessary factors in place¹.

This research is seeking the factors which are prone to induce and sustain the implementation of KM. So the researcher is really after the maturity of the implementation. This maturity is essentially being measured by the mutual assessment instrument and managed by the PDM:

- As it could be seen from the division analysis in section 7.1.1.10, division A had the right DKM profile (*necessary*); the DKM showed initiative (*supportive*); and also quality of performance (*necessary*); he has been supported by management (*supportive*); and the environment at the division was not perceived as self-sufficient (*supportive*). The DKM therefore managed to implement KM with results as shown. Division A had the highest score in the company (1.67) for sharing in the M/A of 2003 (though it decreased in 2004 to 1.3) (the scores are taken from appendix 9).
- As it could be seen from the division analysis in appendix 14, section 14.9, division N had the right DKM profile (*necessary*); the DKM showed initiative (*supportive*); and also quality of performance (*necessary*); he wasn't really supported by the GM who believes in knowledge but not in KM (*supportive*); but given the DKM's perception of KM being relevant to the division's business (*necessary*); and the DKM's trust in long term values (*supportive*), the DKM managed to implement KM with results as shown. Division N gave itself the highest score in the company (1.15) on self-assessment in 2003, though the mutual assessment score was only 0.66. In 2004, they even raised their self-assessment score to 1.9 but were mutually-assessed as 0.93.

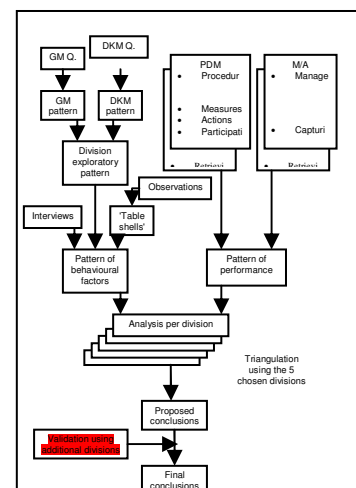
¹ Data for these attributes of the factors is sourced from questionnaires information, interviews reports, and from the author's observations.

- As it could be seen from the division analysis in appendix 15, section 15.9, division S had the right DKM profile (*necessary*); and the DKM showed initiative (*supportive*). Given the DKM's perception of KM being relevant to the division's business (*necessary*), he has managed to relate it to the division operational and business goals and this has awarded the DKM the support of management (*supportive*). Though the requirement from all divisions has been to choose a procedure from each of the life cycle phases of KM (details in section 4.5.1), the DKM of S missed one in 2003 and two in 2004 (*necessary* for quality of performance). Nevertheless, his ability to relate the programme to the core business of the division (*necessary*), compensated for this lack.
- As it could be seen from the division analysis in appendix 16, section 16.9, division J had neither the right DKM profile (*necessary*), nor the management support (*supportive*), and though the DKM viewed KM as relevant to the division's business (*necessary*); and showed initiative (*supportive*), it wasn't sufficient for a successful implementation.
- As it could be seen from the division analysis in appendix 17, section 17.9, division U had the right DKM profile (*necessary*); the DKM showed initiative (*supportive*). Though the division is not perceived as self sufficient (*supportive*), the DKM didn't consider the programme as being relevant to the division's business (*necessary*); the DKM wasn't particularly supported by management (*supportive*) and his administration of the program was such that he didn't achieve most of his goals along the two years of evaluation (*necessary* for quality of performance). Division U also had the lowest score in the company (0.33) for the retrieving phase in the M/A of 2004. The result was of a not successful enough implementation.

7.2 Validation of the proposed pattern over additional divisions

The validation process for the 'proposed pattern of factors' uses two extreme cases, different from those chosen for the research by checking their behavioural factors and relating them to their mutual assessment results. The researcher has chosen two additional divisions, one (K) from the bottom quarter of the order of divisions according to their M/A 2004 results, and one (E) better than A, but still in the second quarter of this order as it appears in appendix 9. The comparison is made at the division analysis level.

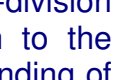
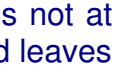
The first is division K which like J, is vertically organized around specific programmes and is dependent on N for its engineering activity. Here too, there is awareness for division-specific and product-specific knowledge within the division, these are cultivated, are used to enhance the division's intellectual property, and the division considers itself as self-contained.



K GM's answers to the questionnaire were more positive than others' regarding the issues of abstract and **long term values**. He claimed to recognize the relevance of the programme to the division's business, but admitted his support for it to be no more than the average. He was very positive about the programme being connected to the division's agenda (**perception of relevance**), about the establishment of a KM organization and about the monitoring process for the programme (**quality of performance**).



Nevertheless, the feeling and responses from the side of the DKM were very different. The DKM was a new employee enrolled to the division to boost its business intelligence capability; he belonged to the T14000 level and didn't realize that KM was too, a part of the criteria for his success (**profile**). He didn't manage to connect the programme to the division's goals (**perception of relevance**), performed very partially with regard of the KM handbook requirements (**quality of performance**), and needless to say he didn't take any **initiative** on the subject. He didn't feel he could ask for support from the GM (**management support**) and therefore didn't manage to activate the directors of the division who were practically left out of the programme. Many of the parameters of this case are similar to the ones of division J. The lack of seniority of K's DKM only made things even more difficult. The main difference between the two is in the recognition on the part of J's DKM of the relevance of KM to J's business; the other one is the initiative of J's DKM which K's lacked. This could have been corrected if the GM had been attentive enough about it and if he had organized a system of requirements and monitoring that would have helped the DKM to manage it (**quality of performance** of the GM as well). The result was a very low grade (0.21) in the M/A of 2003 and in the one of 2004 as well (0.5). These results are therefore not a surprise and confirm the effect of the factors on the implementation process. The second division to be compared with the chosen cases is E. This division is a matrix organization so that the vertical influence of the existing projects is mixing with the horizontal activity crossing all projects. This creates the potential for the sharing of knowledge within the division, but restrains the need for inter-division cooperation. The GM didn't answer the questionnaire but is known to the researcher as a manager who respects long term values, is very demanding of his subordinates but on the other hand supports them very much. He is not at all interested or involved with the KM programme; he trusts the DKM and leaves the monitoring to his deputy. During the first of the two years of evaluation one of his subordinates was the DKM. The performance of the programme was not progressing due to the limited responsiveness the DKM was getting from the directors and from the rest of the division. The GM realized the situation and asked the director to take the task upon himself. The DKM of E is now the director of organization and information. He belongs to the T300 level, is senior (**profile**), and respected in the division, and doesn't seem to suffer from the lack of **management support**. He has **initiative** and has proposed to establish a new portal for E that would enable better



cooperation and sharing within the division. The result of his nomination was the improvement of the M/A score of E from 0.41 to 1.5 in 2004. The conclusion is that management support can be superceded by a high profile for the DKM as a necessary but not sufficient factor. Again, these results are not a surprise and confirm the effect of the factors on the implementation process.

7.3 Final conclusions

The research question was: 'What are the dominant factors in the implementation of a sustainable knowledge management programme in a large corporation'. The final list of factors¹ the author concludes with is not anymore a list of dominant factors, but rather the one observed along the research. Though the author has mentioned the DoK and the environment of the division as factors in the implementation, he has deliberately concentrated on the GM and on the DKM with the data, and therefore the final list of factors refers mainly to the DKM but also to the GM. The following analysis is being performed using table 7-5 along the factors rows, and examining the results of the divisions by columns:

- The DKM profile - Personal and professional background of the DKM, his seniority, and his position in the organisation. The winning combination included a DKM who was senior in terms of the years he has spent with the company, at the management level of deputy director, and with a background of engineering or organization and information systems management.
- Perception of relevance to division performance - Activity or quality recognised to enable concrete and short term benefits for the division and treated accordingly.
- Quality of performance of the programme - Doing as prescribed in the KM handbook, properly applied to the division's environment, and in accordance with its work plan.
- That the DKM and the GM having long term values - Qualities one should care for because they are expected to be advantageous in the long run for the benefit of the individual and of the division.
- That the DKM gets management support from the GM - Management expression of confidence, sometimes open and public, based on a definition of requirements, taking responsibility for them, and on partnership in their achievements; relied upon as a source of authority by the performing level.
- Division lack of self-perception - The way the GM considers the division and acts accordingly. Consideration of division as self-contained and organised to suffice itself.
- Initiative – Mainly on the part of the DKM but also true for the GM, finding ways and resources to make it happen.

¹ The author lists here the factors while their definition could be less than the one taken from section 6.1.4.1 to 6.1.4.7.

It seems one can conclude that:

- The knowledge manager **profile** is a *necessary* factor given the complexity of the task and the necessity to enrol all the division, including its management (without it, the chances of a successful and sustainable KM programme implementation are slim). If missing, it could not be replaced with the **management support** factor (*supportive*) (the GM can support the knowledge manager, but he cannot replace him).
- The **perception of relevance** factor is *necessary* but could be replaced if missing, with the **quality of performance** factor (*necessary*).
- The **management support** is a *supporting* factor (in the presence of a *necessary* factor, the implementation can be facilitated).
- The knowledge manager **initiative** is a *supporting* factor.
- The **long term value** is a *supporting* factor.
- The lack of **perception for self-sufficiency** is a *supporting* factor.
- There are no *sufficient* factors (factors which with or without the support of others, enable the sustainable implementation of KM).

Figure 7-2: Pattern of necessary, supportive, or sufficient factors for KM implementation

It seems that the winning combination of factors that would improve the chances of the KM programme being implemented, are mainly involved with the DKM. It looks like it would be primordial for him to hold a management position, and to be senior, recognized and respected in the division for tasks other than the KM one; it would also be necessary for him to consider KM as relevant to the division's business or at least to fully comply with the procedures. It would help him to have access to the management of the division; and though it is customary to include in success factors lists the issue of management support, the successful DKMs don't really need this support and manage by themselves. The DKM then must be a manager; he must know why KM is being implemented in the division; what is it after; how is it going to be performed and what is the proper timing for it.

7.4 Chapter overview

The analysis of the factors involved with the implementation of KM in the chosen divisions has been performed per division. For each one of the five, the GM and the DKM answers to the questionnaires were reviewed, and then combined into a division exploratory pattern, built on the seven proposed factors. This pattern was then refined using three questions that were asked along an interview of the GM together with his DKM. The result was a pattern of those seven behavioural factors, each labelled as positive or negative using arrows for each of the divisions.

The next step was to investigate the performance of the divisions, whether through the PDM or the mutual assessment scores. The combined picture of

these two sources was presented as a pattern of performance which was then compared with the pattern of behavioural factors to produce the overall division analysis.

The author then triangulated the five cases analyses to produce an emerging pattern of proposed conclusions which was validated using two divisions, additional to the five chosen ones.

8 Reflections and Recommendations

The research question the author has been trying to answer is:

"What are the dominant factors in the implementation of a sustainable knowledge management programme in a large corporation"?

The question has been answered through this thesis and the author summarizes its answers here. The aim of this chapter is to revisit and clarify the context of the research, its topic, the notion of success from the point of view of influencing KM implementation and its reasonableness, to emphasize the novelty of the work, and to suggest expansions from the limitation the research took upon itself. The previous chapters discussed and summarised the major findings from the research. The author briefly highlights the general conclusions drawn and outlines his own view on the strengths and weaknesses of the investigation's approach. A statement of contribution to knowledge is also made. The chapter ends with recommendations for future research and for practitioners.

8.1 Reflections in respect of the research

Having spent the last years researching the subject of knowledge management implementation he had started to practice years earlier, and being in a position to retrospectively reflect upon it and on the effect it has on the conduct of business in an industry of the type of Israel Aircraft Industries (described in chapter 4), the author presents here his views of the research.

8.1.1 The research process

The thesis begins with a discussion on the research approach opted for in this case. Alternative types of design have been examined, and the author has shown the rationale for choosing a flexible design associated with a qualitative strategy. The objective of the research being explanatory, an inductive research strategy has been chosen as being more appropriate. A social inquiry was found to be appropriate to the constructivist approach taken. The methodology of case studies was used for five chosen divisions (a reasonable method with a reasonably sized sample) out of the over twenty there are in the company in which the research was conducted – the company being IAI, for which the author is the Director of Knowledge. In this capacity he has designed the KM programme and has been leading it during the last four years. This is a typical case of action research, and its peculiarity as well as the risks associated with it have been examined, presented, and addressed.

8.1.2 Research strengths

One has to remember that the author of this thesis is actually wearing two hats. On one side, he has been the original and main designer of the programme, he has led it since its beginning and he is responsible for its implementation. On the other hand, he is researching the same KM implementation in order to find factors pertinent to implementation success. Outcomes of the programme are

obviously used as inputs for the research. What is less obvious is that sometimes actions related to the research are influencing the programme. This is a typical case of action research, which is considered as a most demanding and far-reaching method of doing case study research (Gummesson, 1991).

The personal involvement of the author in the design and management of the programme puts him in a very special position quite enviable to a researcher, not only because of excellent access to data, but also because of a thorough understanding of the environment, and of the circumstances accompanying any event. Moreover, the researcher's previous background as a deputy GM of one of the divisions, and his personal acquaintance with the GMs of the divisions researched, enabled a quite high rate of response to the questionnaires distributed, and cooperation from the DKMs.

Conducting this research on a part time basis means that the author continued his activity within the IAI KM programme, which served two purposes: to solve a problem (in this case, to the company the author belongs to), and to contribute to knowledge.

8.1.3 Potential weaknesses

At one extreme, some would doubt that research conducted by outsiders can be effective, at least as far as research into change and development is concerned. At the other extreme, arguments would be to distrust the feasibility of insiders carrying out any worthwhile, credible or objective enquiry into a situation in which they are involved or related to. Two sources of bias that could perturb the researcher's task are identified – one is the effects of the researcher on the case and the other is the effects of the case on the researcher. The first bias is especially relevant when the researcher is, as in this case, part of the programme he is researching. To minimize this risk the author has based the study mainly on objective data. The second bias is lessened by triangulation through multiplying the sources of information for each division. Besides, the programme is fully transparent and published on the IAI-Net, inclusive of its performance, its targets and results, and the scores of its mutual assessment; it is also being monitored by different levels of management. In addition the divisions chosen for the case studies represent four of the five groups of IAI and corporate divisions as well, and they include successful divisions and less successful ones; and the data collected mainly comes from questionnaires and from published PDM targets and results, as well as from the mutual assessment scores, while the personal observations of the author only add colour to this objective data.

The author has been limited in the choice of divisions as case studies. The original intention was to include as case studies, a division from each group and one at the corporate level. Unfortunately, divisions that practically haven't been active in the KM implementation, or from which no questionnaire response was received couldn't be considered. Nevertheless, the choice has been made as a mix of successful divisions and less successful ones.

The design of the questionnaires could definitely be improved so as not to include over-long questions or any with multiple contents (as remarked in section 5.3.4. and 6.2.1.1.2).

Finally, the assessment matrix could be improved to better relate it with the factors realized to be of importance for the implementation of the programme as remarked in section 6.2.4.

8.2 Reflections in respect of knowledge management

The literature abounds with definitions of knowledge, of management, and of knowledge management. They are not the result of alternative rhetoric expressions, but rather of different perceptions about the content of the issue at stake, the context in which it takes place, the preferred state one would like the issue to take, and the description of the recommended path to that state.

8.2.1 KM as a young discipline

It is not clear whether KM can already be labelled as a discipline, but in any case it would be a young one, aged of twenty years or so. Some are not convinced and regard it as a fad - a way to wrap normally practiced management means, into a sophisticated package. This is the reaction some of the GMs and DKMs express when they say "*We think we perform KM without calling it as such*". As one could be impressed by the percentage of sceptical answers of this type by the GMs and the DKMs (63% of the GMs and 69% of the DKMs), the audience of the director of knowledge is not an easy one and unless one can penetrate their own perception about a good reason to implement KM, it will bang on deaf ears. The relationship with the discipline of quality, and the precedence of the highly publicized TQM process, which left many disappointed, mainly because they didn't manage it properly, thought it would deliver by itself, and were not able to admit its failings, are to the detriment of those trying to establish KM as a discipline, meant to help organizations manage what they already recognize as their most valuable asset – their knowledge. Nevertheless, it already has evolved through two or even three generations, the first one restricted to the organizational memory and the way it is populated, used and managed; the second dedicated to sanctify knowledge flow rather than the knowledge itself; and the third, not yet stabilized and with different definitions depending on the various schools of thought.

8.2.2 The importance of a KM strategy structure

8.2.2.1 Implementation timing

The literature refers to KM strategy as the overall picture and plan of the programme at any time along its institution, meaning the concepts and contents that the programme is concentrating on. The author has added another dimension to KM strategy, and this is the time dimension. Implementing such an idea, abstract though it may be, and yet self-evident, is not a one time affair or a one-off action. It has to be carefully cooked, it has to include ingredients serving the matters of principle such as the wholeness of the programme and its relationship with the business; it has to take into account the special tastes of the different users; it has to be served with awareness to its shape in reality and in their perception; and it has to provide support in a meticulous order starting with matters of culture and not to bring in too early, technology

solutions which could spoil the appetite of the participants and derail the programme. This rationale dictated the order of implementation of the programme within IAI; that started with the awareness to the values of the concept, continued with the idea of sharing and with the institution of communities of practice; went on to concentrating on what each group is best at and implementing competence centers; and lately to adding technological content by instituting the issue of content management. In the views of Koenig (2002), this is considered as third generation KM (Koenig, 2002, cited in Firestone and McElroy, 2003a). Extension of the enterprise to the suppliers and customers was considered since the beginning of the programme, but this has been left for later implementation stages, being judged by IAI to require a much more mature organization in its assimilation of the terms, concepts, and values.

8.2.2.2 The choice of a framework

Previous research discovered a profusion of alternative frameworks constituting of KM programmes. These involve the three typical constituents of KM, being culture, processes, and technology in various dosages, but what is stated to matter is its being systematic. As (Drucker, 1993), a father of modern management theory has asserted, one of the most important challenges facing organizations in a contemporary society is to build systematic practices for managing knowledge. Based on practitioner literature, IAI's KM programme seems unique in conceiving a comprehensive framework inclusive of four phases along the knowledge life cycle: capture and document, retrieve for reuse, new knowledge creation, and knowledge sharing. Along the four phases of the KM life cycle, the IAI KM programme consists of twelve procedures, a main advantage of which was that they have been chosen by the DKMs for the benefit of their own divisions.

One of them is about Communities of Practice which appear to be unusual in their implementation within IAI as compared to implementations described in the literature. Indeed they combine the virtual aspect of communities over the IAI-Net with physical meetings on a monthly basis; like others they are self-governed and convene on a voluntary basis; but they differ from other benchmark examples in that they decide for themselves on goals and targets, which are deliberately designed to become a strong bind between the participants of the community and a vital factor for its sustainability. In this, they are similar to ones published in the literature, yet, very different from them.

Another procedure deals with competence centres which had already long existed in IAI. What the KM programme contributed to them is a structure: who knows what; what do the centre's people know; what do the benchmark centres know; a means to assess what the center knows versus what it should know; and a programme to deal with the gap. This is recognized as real, down-to-earth, benefits to the divisions, and when it is associated with KM, the programme gains credibility from it.

8.2.2.3 Link to business

Among other factors identified to contribute to the sustainability of any KM programme, is its link to the business strategy of the organization. IAI does it using the KM measurement element and relating it at three levels, firstly to the

mere performance of the programme, to its implementation throughputs, and lastly to the operational and business results. The author has approached the general issue of measurement with caution, trying to answer the basic question on "why do we measure at all?" before investigating the various available metrics for KM. The dangers of measurement, and especially for an entity as abstract and subjective as knowledge management, have been discussed; yet the author believes that those people preventing themselves from measuring KM in the name of these dangers, mainly do so due to the difficulty in performing this important task, and then theorize about the illegitimacy of measuring KM. The way this has been done in IAI's KM programme, is twofold. On one side, the divisions test periodically their performance of methods for the implementation of the programme, as part of the self-assessment process; and on the other, they set themselves targets, which they know are related to their operational performance and these, are monitored as part of the Hoshin Kanri process, so that KM is clearly linked to the business.

8.2.3 The importance of management tools

One of the main factors playing a crucial role for the implementation of KM in IAI is the way it is managed. The author has presented two of the management tools used for the KM programme: the Hoshin Kanri method and the self assessment process.

Hoshin Kanri has been presented as one of the most structured management tools that literarily connects goals to actions through measures and does it in a coordinated way across the whole company; a tool to practically deploy a policy over all divisions and within them at all its management levels. The usage of the Hoshin Kanri method for the PDM as a management tool for the programme, enables the establishment of a clear connection between the strategy of the division, its goals, measures and targets, and the action it is going to take in order to achieve them. This is also supplying transparency in the management of the programme at all levels of personnel across the whole company; it means that any employee can see at any moment what the achievements of any of the 23 divisions of IAI in implementing KM are. This publicity and the will of most managers to display a positive picture of the performance of their division are some of the generators of the programme. Combining this tool with the three levels measurement method makes it a very powerful means for the planning of the programme, for its everyday management by the DKMs, for its monitoring in a perfectly transparent way across the whole company, and for achieving its goals. This is a most unusual way of using Hoshin Kanri, which beyond the scarcity of its usage in western corporations, was mostly applied for the deployment of the company's business strategy and to the best of the author's knowledge, never yet for the deployment of change in general and knowledge management specifically.

The self-assessment method draws its value from its very basic definition – its being performed by the divisions themselves in a uniform way across the company. Beyond this fundamental virtue, the staged construction of the method depicts a natural evolution for the organization that must be aware of the principles of the programme before it can train itself for it, on its way to

understanding it, as a prerequisite for committing to it, and before it becomes a habit – five levels to the assessment test.

8.2.4 Reflections in respect of the research objectives

The research objectives were to find the dominant factors in the implementation of a sustainable knowledge management programme in a large corporation. Previous research discovered a profusion of factors liable to influence the implementation of a KM programme. The author sought published lists of factors relevant to KM success, and filtered these using his own managerial experience, ending up with an inventory of preliminary factors. This was later refined to be the list of seven proposed factors for two of the main role holders for the KM implementation, namely the division's General Manager and his Division Knowledge Manager. In this analysis process (described in figure 7.1), the author used a vast amount of structured information from a quite elaborated questionnaire answered by most of role holders; interviews with them in couples by division for the five chosen ones; and his own personal observations as the director of knowledge of the company, noted along the four years of performing the programme (partially shown in appendix 12) and classified in table shells for the two evaluation years (shown in appendix 13). The quantity and diversity of data should suffice in providing a reasonable basis for the research to rely on. Since the research is dealing with successful sustainable implementation, and the very usage of the term sustainable implies that the effort hasn't only been initiated, tried, ventured, but it has also sustained the competition in management attention and in all the other scarce resources in which corporations operate, successful was given a working definition.

The analysis of the success assessments was based on two objective sources of information: firstly the PDM objectives, measures, targets and their achievement, actions, and their distribution across the division, and secondly the self and mutual assessment of the implementation. The author hasn't only based his analysis on these objective results, but also compared them between the two years of the evaluation to discern any trend liable to show growth in the maturity pattern, and also triangulated between the five chosen divisions, and compared with company averages to moderate any local reasoning related to the specific environment of any given division. The total score has been reasonably chosen to be the sum of the PDM and the M/A scores.

Having ranked the chosen divisions for their defined success, the author has then studied the relationship between this order and each case's pattern of behavioural factors, to establish the recommended list of success factors as the result of the analysis. These were also evaluated for their being necessary, supportive or sufficient for the successful implementation of a KM programme. By this the main objective of the research has been attained.

Although the literature suggests a positive impact on the competitive advantage of the organization due to the existence of factors as listed in appendix 1 (Holsapple and Jones, 2004a), the author has stopped short of this statement and has limited the impact expectation to the successful implementation of the programme itself.

8.3 What could be learned from the literature

8.3.1 Success factors

Success factors are sometimes labeled as "the areas where things must go right for the *business* to flourish"; "what the organization must accomplish to achieve the *mission* by examination and categorization of the impacts"; "the minimum key factors or sub-goals that the organization must have or need, and which together will achieve the *mission*"; "the few things that must go well to ensure *success* for a manager and/or organization" (Davenport et al., 1998; Liebowitz, 1999, cited in Alazmi and Zairi, 2003). In the case of this research dealing with the implementation of KM, this is the *mission* and one would have to hope that it will result in *business* to flourish.

The author has presented in section 3.4 a long list of enablers or factors claimed by different researchers to be at the source of the organization being successful in implementing KM. Some even call them "critical" success factors (CSF) (Herder et al, 2003) without really paying attention to the intensity of the word. Factors have been categorized around people, processes or the technology enabling KM. Some researchers have looked at the type of knowledge as being relevant to the implementation (Kalling, 2003). Others have looked at the organization's structure (Mason and Pauleen, 2003), or at the organization's culture (Park et al, 2004) as being the reason for success or failure in putting KM into practice. The author has used some of the published factors as a first cut in his search for the proposed list of success factors.

8.3.2 KM frameworks

KM seems to be of a complex nature so needing the description of a framework involving all the aspects of its implementation, and the author has related most of them in section 3.2.5. Some researchers even differed between KM frameworks and KM implementation frameworks (Wong and Aspinwall, 2004). Most have stressed that the main feature of any framework – is its being methodical. Generally, KM frameworks would have a certain element as central, while the others would be supportive of it – knowledge creation by (Nonaka and Takeuchi, 1995) or (Gore and Gore, 1999); resources, activities, and influences by (Holsapple and Joshi, 2002); knowledge at the service of the business by (Wiig, de Hoog, and van der Spek, 1997); the value of the organization's assets by (Mentzas, 2001) or (Edvinsson and Sullivan, 1996); the sociology of knowledge by (Alavi and Leidner, 2001). Some have grouped the various existing frameworks by schools of thoughts (Earl, 2001) – technocratic, economic, or behavioural; or by dimensions (Chauvel and Despres, 2002) – phenomenon, action, level, knowledge, technology, and outcome. The issue of a knowledge life cycle (refined by (Firestone and McElroy, 2003a, p.48) has also been addressed in section 3.2.5.1 in as much as one can discern a generic pattern dealing with knowledge as Deming did for quality in the Plan-Do-Check-Act cycle. This again shows the IAI KM framework as similar yet different than the published ones and even the one of Firestone and McElroy - planning, acting, monitoring, and evaluating, as opposed to capturing and storing, retrieving for reuse, creating, and sharing.

8.3.3 Linking KM to the business

The link of KM to the business goals or at least to the organization's operational targets has been established as one of the success factors (see section 3.3.2). The literature doesn't abound in ways or methods for it. Some researchers recommend making the connection between KM and the company's strategy as explicit as possible (Skyrme, 2002), in as much as using the same tools (Drew, 1999). Though the very measurement of KM (reported in section 3.5.2), let alone of knowledge itself, is controversial, it seems that only its relation to the business performance could convince the decision makers to adopt it as an enabler (Carrion et al., (2004) or (Ahn and Chang, 2004). Various organizations have done more than others in the development of tools for the measurement of knowledge management implementation as the automotive industry (Levett and Guenov, 2000), or the US department of the Navy (Department of the Navy, 2001). The IAI KM programme has proven novelty in using the KM measurement levels, to link it to the organization's operational targets and to its business goals.

8.3.4 The management tool of Hoshin Kanri

Hoshin Kanri doesn't seem to be very popular in Western organizations, and even in the few where it has been implemented, its task has been to manage the deployment of the company's strategy as described in section 4.5.1. However, the faculties of the method exposed by Kondo (1998), or by (Tennant and Roberts, 2000), are such that IAI used it for change implementation in general, and specifically for the implementation of knowledge management. This application seems to be totally novel as no publication has been discovered about it.

8.3.5 Monitoring KM capability maturity

It is generally acknowledged that self-assessment focuses on continuous improvement through organizational learning, whereas the more conventional audit and review approach does not (Tennant and Roberts, 2003). Self-assessment is aimed at providing organizations with a systematic and regular measurement system leading to the implementation of planned actions. The process has been introduced by the adoption of quality national awards such as the Malcolm Baldrige National Quality or the European Foundation for Quality Management. Such a 'stages of growth' model has been used for the organizational life cycle, the product life cycle, sales growth, etc. but also for KM implementation (Housel and Bell, 2001 cited in Gottschalk and Khandelwal, 2004p.136). This only case found (described in section 4.6.1) is comparable but not similar to the stages definition used along this research.

8.4 Research conclusions regarding the factors related to the GM and the DKM

The final list of factors the author concludes with is not anymore a list of dominant, key, or critical factors, but rather the success¹ factors that were

¹ Using the success definition of section 5.2.

observed along the research. Though the author has mentioned the DoK and the environment of the division as factors in the implementation (in sections 6.1.3.3 and 6.1.3.4), he has deliberately concentrated on the GM and on the DKM with the data, and therefore the final list of factors refers mainly to the DKM but also to the GM. The research concluded by proposing the following list of factors for the DKM and for the GM. This list is not comprehensive and is limited by the data gathered. The definition of the factors that originally appeared in sections 6.1.4.1 to 6.1.4.7 has also been limited by what has been observed (e.g. exclusivity of dealing with KM for the DKM, was found as unapplicable in all the cases researched; taking the initiative of securing sponsorship, was found to be limited to a limited type of DKMs who needed the support). Based on the outcomes of the research, they have been suggested to be labeled as necessary, supportive, or sufficient for the successful implementation of KM (the terms have been introduced in section 7.1.6):

Factor	Description	Necessary, supportive, or sufficient
Knowledge manager profile	Personal and professional background of the knowledge manager, his seniority, and his position in the organisation. The winning combination is a DKM who was senior in terms of the years he has spent with the company, at the management level of deputy director, and with a background of engineering or organization and information systems management.	<i>The knowledge manager profile is a necessary factor</i> given the complexity of the task and the necessity to enrol all the division, including its management (without it, the chances of a successful and sustainable KM programme implementation are slim). If missing, it could not be replaced with the <i>management support factor</i> (the GM can support the knowledge manager, but he cannot replace him).
Perception of relevance to division performance	Activity or quality recognised to enable concrete and short term benefits for the division and treated accordingly.	<i>The perception of relevance factor is necessary</i> but could be replaced if missing, with the <i>quality of performance factor</i> .
Quality of performance of the programme	Doing as prescribed in the KM handbook, properly applied to the division's environment, and in accordance with its work plan.	
The DKM getting management support from the GM	Management expression of confidence, sometimes open and public, based on a definition of requirements, taking responsibility for them, and on partnership in their achievements. Relied upon as a source of authority by the performing level.	<i>The management support</i> is a supporting factor (in the presence of a necessary factor, the implementation can be facilitated).
Initiative	Mainly on the part of the DKM but also true for the GM, finding ways and resources to make it happen.	<i>The knowledge manager initiative</i> is a supporting factor.
The DKM and the GM believing in long term values	Qualities one should care for because they are expected to be advantageous in the long run for the benefit of the individual and of the division.	<i>The long term value</i> is a supporting factor.

Factor	Description	Necessary, supportive, or sufficient
Division lack of self-perception	The way the GM considers the division and acts accordingly. Consideration of division as self-contained and organised to suffice itself.	The lack of <i>perception for self-sufficiency</i> is a supporting factor.

Table 8-1: Pattern of necessary, supportive or sufficient factors for the GM and the DKM

No factors for the GM or the DKM have been considered as *sufficient*, (factors which, with or without the support of others, enable the sustainable implementation of KM).

8.5 Contribution to knowledge

The research has contributed to the body of knowledge about KM implementation through the following:

- A description of a comprehensive framework for KM, inclusive of the four specified phases along the life cycle of knowledge within the organization dealing with the population and usage of the organizational memory, the rejuvenation of knowledge creation, and the expression of knowledge flow through knowledge sharing seems to be an innovative combination though its elements are comparable to those in other existing frameworks.
- The application of this comprehensive framework for KM, along with its various procedures and their defined measures, as implemented and reported for the pattern of performance used in the analysis, is unique to the case researched.
- A connection between the KM programme and the operational and business goals of the organization, materialized through the multi-level measurement of the attainment of KM goals has been shown as instrumental to a successful implementation of knowledge management.
- The description of usage of the Hoshin Kanri method for the management of the KM programme; its attributes and utility; and its advantages have been provided within this research.
- The application of the Hoshin Kanri method, along with its structure of goals, measures, and actions, have been uniquely observed for KM along this research.
- The usage of the staged CMM structure for the assessment of the depth and maturity of KM implementation in the organization; its attributes and utility; and its advantages have already been described in the literature. Nevertheless, the peculiar application adapted to the requirements of the programme and its framework, as observed along this research, constitutes a contribution to the existing body of knowledge.
- The proposed factors mentioned in the previous section and further understanding of the roles of the GM of any organization implementing KM and to the person appointed as the knowledge manager of the organization are repeated here and constitute a contribution to the existing body of knowledge:

- The profile of the knowledge manager, his position and seniority and what are his other tasks in the organization.
- The acceptance that the implementation of KM is relevant to the organization's operational objectives and business goals and the recognition of these causal effects.
- The existence of a structured framework for the organization to follow, detailed enough to provide a frame of reference for implementation, and its implementation.
- The acceptance of long term values both by the GM and by the knowledge manager.
- The interaction between the knowledge manager and the GM regarding the programme and its support.
- The openness of the GM to the need his organization has for knowledge external to it, and the extent to which it is transmitted across the organization, creating a basis for knowledge sharing.
- The level of initiative the knowledge manager is capable to exert in order to customize the programme however structured it is, to the peculiar needs of the organization.
- Though most factors proposed as success factors at the outcome of this research are mentioned in the literature, their combination is unique (to the best of the author's knowledge), and constitute a contribution to the existing body of knowledge.

8.6 Recommendation for further research

8.6.1 Expansion to other types of organizations

This research took place in what the author has labeled as a *large* organization, characterized by its structure divided into groups and divisions, with multiple levels of management which express themselves by conceiving and materializing policies of a local nature, though they are related or at least bounded by the company's vision. The importance of a structured programme and of management tools such as the Hoshin Kanri method are then of essence. The author nevertheless believes that these would be of no lesser significance in smaller organizations, yet it remains to be further substantiated.

8.6.2 Elimination of the action research issue

The issue of action research and the influence of the director of knowledge of the company being the researcher have been addressed. Nonetheless, a similar research conducted in an organization for which the researcher would be an external personality, might throw a different light on the issues discovered.

8.7 Contribution to practitioners

The research is expected to:

- Motivate practitioners' reflection about the importance of a methodically structured programme.

- Help practitioners understand better the factors liable to enhance the implementation of such a programme.
- Help practitioners implement and manage a knowledge management programme.
- Support practitioners in the acceptance and implementation of measuring knowledge management as a means to focus it and to connect it to the organization's business goals.
- Support practitioners in the usage of Hoshin Kanri as a management tool for KM implementation.
- Support practitioners in the acceptance and usage of a self assessment method for KM implementation.
- Provide recommendations to top management about the position of such a programme in relation with the organization's strategy and about the choice of the knowledge manager.

8.7.1 A road map to business success

The author has already mentioned that this research has stopped short from relating the implementation of knowledge management to actual operational results or business performance. Extending the dependent success variables to be directly related to tangible business results could be envisaged as a possible road map to business success.

The third level measure of the PDM - the operational or business results - are targets chosen by the DKM and approved by the GM of the division. Monitoring those measures would focus attention on the procedures chosen to affect them and would indicate a concrete relationship between KM and business results. Moreover, the author is convinced that the choice of such targets would have an effect surpassing their being dependent variables because it would create a movement of interest in the programme and its implementation in order to achieve the business results.

A proposed hypothesis for future research would be: 'Organizations using Hoshin Kanri as a management tool for the implementation of KM and choosing business results measures related to their KM activity, have a better chance of successfully implementing a sustainable KM'. This could not be done within this research, due to the number of cases in which such measures were chosen being too small. It is expected that as time goes on and more experience is accumulated in the KM implementation, there will be more cases enabling such research.

8.8 Final comment

The purpose for the implementation of knowledge management has been stated as being the enhancement of the firm's competitive advantage and the achievement of its operational and business goals. The event accomplishing the intended purpose is the *successful* implementation of the programme. The author has therefore regarded success for the purpose of this research as a variable, dependent on the factors concluded as proposed. As already remarked the author hasn't made any attempt to correlate those factors with

business results or even with competitive advantage but this connection is intuitive.

Knowledge management is now a recognized term; very much publicized, and increasingly accepted in the corporate community. This research has contributed to our understanding of knowledge management and its implementation by providing a list a factors, which though each seems self-evident, their combination, and the experience acquired in applying them is hoped to be useful to support practitioners who are implementing knowledge management, and useful to researchers seeking to deepening our knowledge about it.

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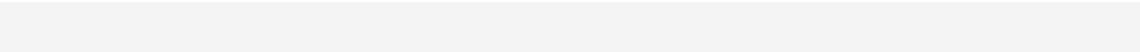
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10 Appendices

Appendix 1: Rank order tables of KM activities

(Adapted from (Holsapple and Jones, 2004a))

Acquisition activities		
Activity	Impact on competitiveness Significance¹	GM questions²
Soliciting knowledge from external sources	19.5	2.3.8
Monitoring technological advances	18.8	2.3.3
Reviewing professional literature	8.9	2.3.8
Participating in collaborative acquisition	4.2	2.2.7
Indirectly acquiring knowledge on an individual basis	4.2	
Indirectly acquiring knowledge en masse	3.3	
Using competitive intelligence, looking for windows of opportunity, obtaining trade secrets	11.5	
Obtaining / licensing patents, copyrights	1.2	3.1.9
Receiving external training	1	3.3.1, 3.3.2
Obtaining / licensing data sets	1.7	

Selection activities		
Activity	Impact on competitiveness Significance	GM questions
Seeking out people's know-how, know-what and know-why	88 ³	2.3.2
Recalling from a technological repository	6.2	2.3.5
Awareness of processes & events in the organization, looking for windows of opportunity, observing behavior of participants in the organization	13.5	
Participating in in-house training	38 ⁴	2.5.3
Recalling from a non-technological repository	2.3	2.3.6

¹ The significance was calculated as the ratio between the percentage of strong perceptive answers to weak perceptive answers in the Holsapple and Jones survey.

² As they appear in the GM questionnaire (appendix 10)

³ The percentage of strong perceptive answers (there were no weak perceptive answers).

⁴ The percentage of strong perceptive answers (there were no weak perceptive answers).

Generation activities		
Activity	Impact on competitiveness Significance	GM questions
Developing products / processes	12.1	3.1.8
Devising or developing strategies	18.5	3.2.7
Making decisions	17.5	1.2.6
Generating through collaboration	8.6	2.3.7, 3.2.9
Creating	14.8	2.2.8, 2.2.9
Learning lessons, sense-making	14.8	2.3.6, 3.1.6, 4.2.1
Inferential derivation	3.8	
Analytical derivation	1.6	
Mining	0.4	

Assimilation activities		
Activity	Impact on competitiveness Significance	GM questions
Formal internal interaction	15.8	
Informal internal interaction	4.7	
Informal internal publishing	3.3	3.1.4
Formal internal publishing	2.6	3.1.3

Emission activities		
Activity	Impact on competitiveness Significance	GM questions
Formal external interaction	73 ¹	3.3.1, 3.3.2
Formal external publishing	3.1	
Informal external interaction	3.1	3.3.1, 3.3.2
Informal external publishing	1.2	

Control activities		
Activity	Impact on competitiveness Significance	GM questions
Protecting / providing access control	4.3	
Controlling KM processors	1.3	
Controlling financial resources available for KM	1.7	3.2.10
Controlling quality	1	
Using a risk management standard	0.8	
Managing / monitoring KM	1	
Auditing knowledge	0.7	3.1.14

¹ The percentage of strong perceptive answers (there were no weak perceptive answers).

Measurement activities		
Activity	Impact on competitiveness Significance	GM questions
Determine / develop quantitative measures	6.8	1.3.6
Determine / develop qualitative measures	3.1	1.3.6
Tracking stakeholder information	3.3	
Measuring knowledge resources	1.8	3.1.14
Measuring effects of KM	1.2	2.6.5, 3.1.15
Measuring KM abilities / skills	0.8	
Managing / monitoring KM	0.7	
Valuing knowledge	0.5	
Measuring KM activities	0.7	1.3.6, 1.3.8

Coordination activities		
Activity	Impact on competitiveness Significance	GM questions
Securing sponsorship	5.4	
Building infrastructure	8	2.3.1
Establishing communication patterns	2	3.2.8
Establishing incentives and motivating employees	8.4	2.2.2
Explaining KM to employees	1.6	2.5.2
Structuring knowledge work	1.3	
Allocating knowledge workers	1.3	

Leadership activities		
Activity	Impact on competitiveness Significance	GM questions
Creating a KM cultur	10.1	2.1.1, 2.1.2
Aligning KM with business strategies	7.5	3.2.7
Sharing a leader's knowledge	4.5	2.1.3
Analyzing the business case	3.8	
Establishing KM guidelines	2.8	
Delegating activities	2.9	3.1.12, 3.2.5

Appendix 2: Success factors (1)

(Adapted from (Alazmi and Zairi, 2003))

(Wiig, 1996)	Knowledge assets to be used
	Knowledge-related processes to be managed
(Davenport et al, 1998)	Link to economic performance*
	Technical and organizational infrastructure*
	Flexible knowledge structure*
	Knowledge-friendly culture*
	Clear purpose and language
	Change in motivational practices
	Multiple channels for knowledge transfer
	Senior management support*
(Davenport and Prusak, 1998)	Network
	Knowledge creation and dissemination
	Knowledge sharing
	Electronic repositories of knowledge
	Training, culture and leadership*
	Issues of trust
	Knowledge infrastructure*
(Morey, 1998)	Available
	Accurate in retrieval
	Effective
	Accessible
(Trussler,)	Appropriate infrastructure*
	Management commitment
	Creating motivation to share
	Right people and data
	Culture*
	Network
	Available to collaborators
	Training*
(Finneran,)	Creation of culture*
	Sharing
	Creative knowledge
	Worker's buy-in
(Liebowitz, 1999)	KM strategy with senior leadership support*
	CKO*
	KM systems and tools
	Incentive to motivate sharing
	Supportive culture*
(Manasco, 1999)	Knowing community
	Creating context
	Overseeing content

	Infrastructure
	Enhancing process
(Bassi, 1999)	People learn
	People implement
	Sharing
(Choi, Y. S., 2000)	Training
	Employee involvement
	Teamwork
	Empowerment*
	Top-management commitment*
	Organization constraints
	IT infrastructure
	Egalitarian climate
	Knowledge structure*
(Skyrme, 2000)	Top management support*
	Links to business strategy*
	Knowledgeable about knowledge
	Vision and architecture*
	Leadership and champions*
	Systematic knowledge processes*
	Knowledge infrastructure*
	Bottom line measures*
	Culture to support innovation*
	Technical infrastructure
(Skyrme and Amidon, 1999)	Link to business imperative*
	Vision and architecture*
	Knowledge leadership*
	Knowledge creating and sharing culture*
	Continuous learning
	Technology infrastructure
	Systematic knowledge processes*
(Streels, 2000)	Staff to buy-in
	Lines of communication
	Sharing
	Writing weekly updates
	Management support
(Haxel, 2001)	Knowledge structured
	knowledge organized
(Heisig, 2001)	Store experiences
	Exiting e-mail culture
	IT business focused
	Integrated among process
	KM task combined with daily work

* Items with an asterisk are success factors close to those used for this research.

Appendix 3: Success factors (2)

(Adapted from (Bij et al, 2003))

Factor	Notes
Individual commitment*	Based on intention, autonomy, and environmental fluctuations that generate new patterns of interaction between people and their environment
Organizational crisis*	Disruptive events may lead to the demolition of existing frames of ideas and beliefs and so offer the opportunity to build new ones.
Co-location**	Enabling communication among personnel
Risk-taking behaviour*	Emphasis on processes rather than outcomes, legitimisation of 'intelligent' ¹ failure, development and maintenance of individual commitment to 'intelligent' failure through organizational culture and design, and emphasis on failure management systems instead of individual failures.
Long-term orientation*	The costs of learning are immediate, and the benefits are long-term. Long-term orientation offers a stable strategic direction, implemented by a steadily growing number of organization members.
Management support*	Senior management support includes providing clear objectives and appropriate organizational structures for integration, and also signals that the organization values cooperation
Information technologies	Mainly communication and decision-aiding technologies
Lead user and supplier networks	Lead users and suppliers are important sources of learning for innovation in firms. (Nonaka, 1994 cited in Bij et al, 2003) argues that sharing tacit knowledge with suppliers or customers through co-experience and creative dialogue plays a critical role in creating relevant knowledge.
Formal rewards	The relationship between organizational knowledge and competitive advantage is moderated by the firm's ability to integrate and to apply knowledge, and this is supposed to be influenced by rewards
Organizational redundancy	When organization members share overlapping information, they can sense what others are trying to articulate; so, redundant information can stimulate the exchange of non-redundant information.
<i>Teams</i>	
<i>Job rotation</i>	
<i>Feedback mechanisms</i>	
<i>Post-project evaluation</i>	
<i>R&D budget</i>	

¹ Failure that is likely to facilitate learning.

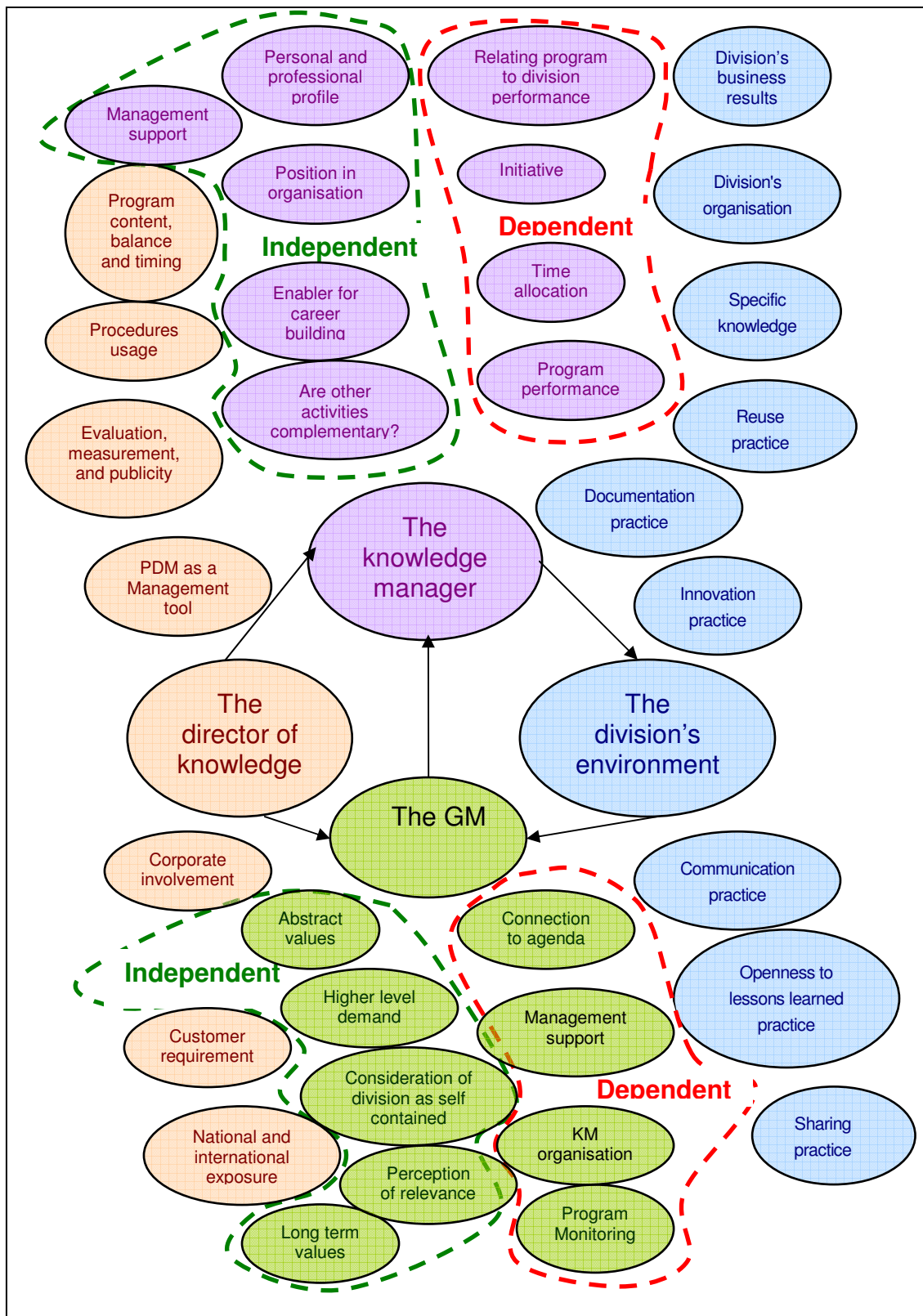
<i>Asset specificity*</i>	
<i>Goal congruency</i>	

* Items with an asterisk are success factors close to those used for this research.

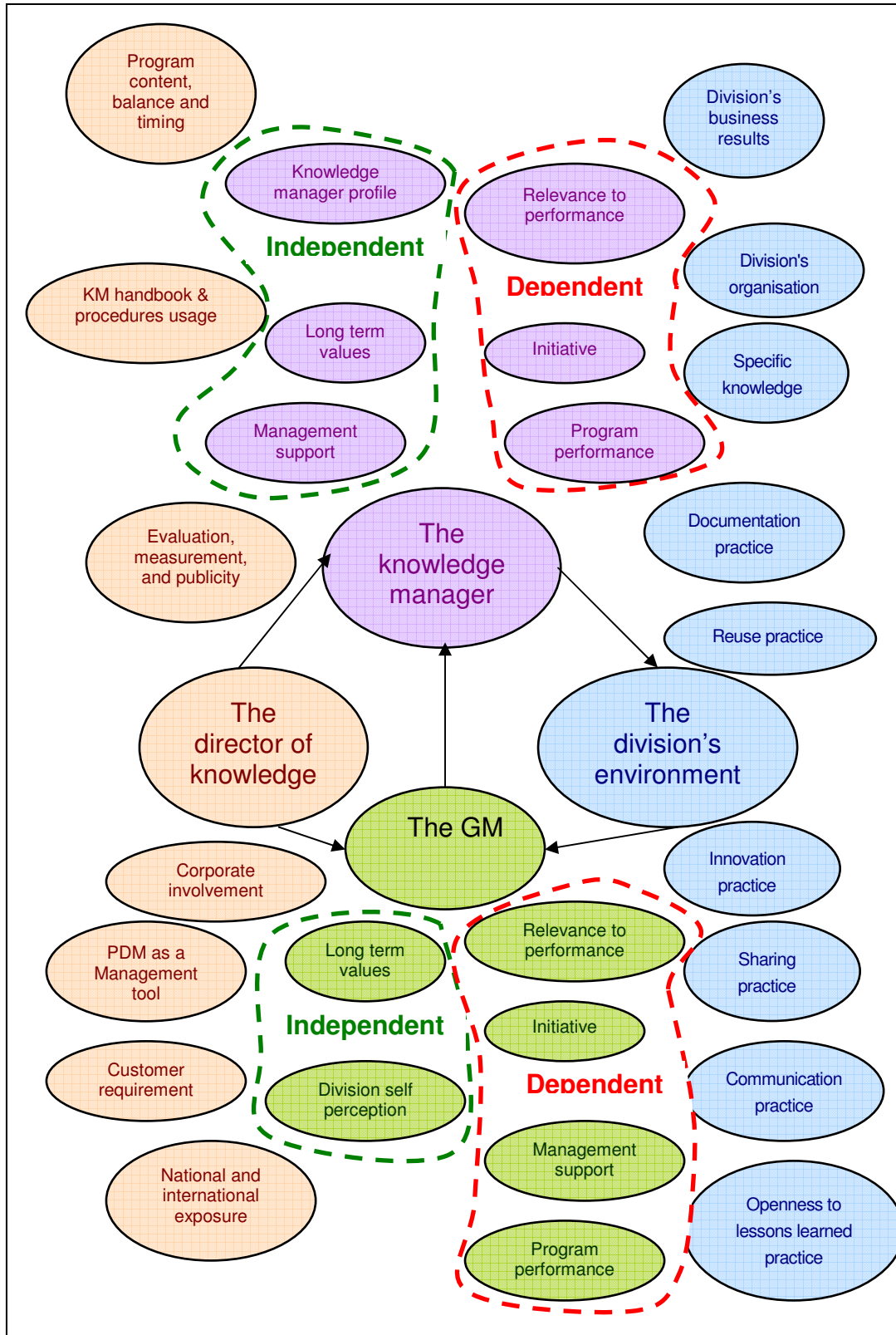
** Specific to knowledge dissemination while the other also fit other knowledge processes.

Italic item are beyond the importance of the first ten.

Appendix 4: Preliminary factors



Appendix 5: Proposed factors



Appendix 6: The KM-PDM

Objective/Measure Matching					Measures	Basis	Target	Action/Measure Matching				
●				○	Performance			○				●
○	●			○	Result				○		●	
		●			Performance					●		○
			●		Throughput				●			
	○			●	Performance			●		○		
Knowledge sharing	Knowledge creating	Knowledge retrieving	Knowledge capturing	Awareness enhancement	Measures			Action for awareness	Action for capturing	Action for retrieving	Action for creating	Action for sharing
					Objectives		Actions					
Legend: Full matching ● Partial matching ○					Participants			Participant/Action Matching				
					Directorate a			●				○
					Directorate b				●		○	
					Directorate c			○		●		
					Directorate d				○		●	
					Directorate e							●

Appendix 7: The mutual assessment questionnaire

- **Programme management and implementation**

- Level 1 to assess that planning and managing the programme is using the PDM as specified above; ensuring that the programme is on the division's agenda; and that it is properly communicated.
- Level 2 to assess that the programme is related to the division's operational and business goals; that proper training was conducted at the T1000 level; and that at least one measure is a throughput measure.
- Level 3 to assess that the division's management is active in choosing KM procedures adequate to its operational goals; that KM is being implemented in non-technical fields as well; and that at least one measure is a throughput measure and another is a business result measure.
- Level 4 to assess that the programme is being initiated at the directorate level; that specific operational and business goals are identified as results of KM activity; and at least two measures are throughput measures and another two are business result measures.
- Level 5 to assess those employees that have KM activities as a personal commitment; that the division's operational goals are dictating the content and target of the KM programme; and that projects can display a relationship between achieving their aims and KM activities.

- **Capturing and documenting knowledge**

- Level 1 to assess that there is a plan for the capture of critical knowledge; that there is a homepage for lessons learned in the division's Intranet site and that they are being sent to interested parties as soon as generated.
- Level 2 to assess that proper training has been conducted for the implementation of content management; and that the team for the generation of insights out of lessons learned has convened at least once.
- Level 3 to assess that at least ten saving rules have been established for the content management process in the division; and that lessons learned can be shown of being implemented.
- Level 4 to assess that at least 50% of the division documents are using the content management structure; and that lessons learned from other divisions can be shown of being implemented.

- Level 5 to assess that at least 80% of the division documents are using the content management structure; and that the implementation of lessons learned can be shown of being related to business results.
- **Retrieving and reusing knowledge**
 - Level 1 to assess that there are homepages and concrete plans for at least two competence centres; that the division maintains a database of previous proposals; and that there are processes systemising the reuse of knowledge.
 - Level 2 to assess that the plans for the competence centres are being performed; that a process for the generation of proposals based on previous ones is in place; and that information from customers is feeding back the proposal database.
 - Level 3 to assess that the division's competence centres homepages are connected to the company's technical database; that the division technical processes are seen to require information from the technical database; and that the division business processes are seen to require information from the business database.
 - Level 4 to assess that the division is using information from other divisions through the technological database; that the division has established a business database; and that the division's intellectual property is identified in proposals.
 - Level 5 to assess that the initiative to documentation is inherent to the activity of the competence centres; that the division is using information from the company's technological and business databases; and that the advantage of using prior information can be identified.
- **Creating new knowledge**
 - Level 1 to assess that information created along the project development is located in the project shared directory for common usage; and that cases of importing new knowledge to the division can be identified.
 - Level 2 to assess that lesson learned from other projects are being published in the division; and that the import of new knowledge to the division is done methodically.
 - Level 3 to assess that new projects are implementing lessons learned; and that the process of new knowledge import is performed by the competence centres.
 - Level 4 to assess that new projects are implementing lessons learned from other divisions; and at least new knowledge is imported from exhibitions and congresses.

- Level 5 to assess that the project knowledge procedure applies to non-technological projects as well; and that the employees are encouraged to publish in the appropriate literature and conventions.
- **Sharing knowledge**
 - Level 1 to assess that the number of number of active participants and the communities of practice to which they belong is increasing; that practices can be identified as candidates to be proposed as good practices; and that the division's homepage fits the need of its customers.
 - Level 2 to assess that the number of communities of practice led by the division is increasing; that proper training was conducted on the generation of good practices; and that proper training was conducted on the effective usage of the Intranet.
 - Level 3 to assess that the division is leading at least two technological communities of practice and they have generated good practices for the benefit of the whole company; that at least two good practices are proposed to the company on a yearly basis; and that the division's homepage is updated on a monthly basis and fitting the profile of its customers.
 - Level 4 to assess that at least 50% of the goals set by the communities of practice led by the division have been met; that the division is considering good practices proposed by other divisions; and at that the content managers of the division's homepage are attentive to the satisfaction of their customers.
 - Level 5 to assess that at least 80% of the goals set by the communities of practice led by the division have been met; that good practices proposed by other division are implemented in the division; and that information on the division's homepage benefits employees from other divisions as well.

Appendix 8: The mutual assessment matrix

The KM Chapters	Awareness (1)	Training (2)	Understanding (3)	Commitment (4)	Habit (5)
Managing and Implementing the Program	<i>Programme performance</i> - The CKO and additional knowledge workers were nominated	<i>Management support</i> - The division's management is conducting formal follow-up sessions of the KM activity and presents it to the variety of workers (as during communication gatherings)	<i>Management support</i> - The Division's management is initiating the processes at the competence centers and at the communities of practice	<i>Programme performance</i> - KM activity is initiated in most directorates	<i>Long term value</i> - KM is the common practice within the operational procedures at the project and the professional group levels
	<i>Management support</i> - KM is on the division agenda	<i>Management support</i> - The KM procedures are connected to the division's policy deployment matrix	<i>Programme performance</i> - KM is conducted through its 4 chapters also in non-technological areas (HR, finance, marketing, logistics, etc.)	<i>Management support</i> - Follow-up and monitoring sessions at the division's management level include KM issues	<i>Long term value</i> - KM is part of the MBO objective at all levels of workers
				<i>Management support</i> - Management at all levels back-up decisions made by knowledge workers	<i>Long term value</i> - Reusing existing knowledge is the common practice at the project and the professional group levels
				<i>Relevance to performance</i> - Throughputs and business results (as reusing design, shortening the design cycle) have been defined, to enable the assessment of the effort to be invested in KM	<i>Relevance to performance</i> - Projects are relating their KM activity to standing up to their commitments of constant improvement and increased profit
	Legend: <i>Factor</i> – Assessing question				<i>Relevance to performance</i> - The division's KM programme is built based on business results and include activities in all 4 chapters of KM

Capturing and Documenting Knowledge	<i>Programme performance</i> - The division has a plan for the identification of knowledge subjects to be captured	<i>Programme performance</i> - Common categorization have been part of a training programme	<i>Programme performance</i> - Categories are kept at 80% of commonality while saving documents	<i>Relevance to performance</i> - Saving in cycle time and the number of ECPs is identified and attributed to the usage of processes for the capture of knowledge	<i>Long term value</i> - Knowledge is being documented without the intervention of the knowledge workers
	<i>Programme performance</i> - The division's debriefed cases have been mapped	<i>Programme performance</i> - The debriefing results have been mapped to a generic data base	<i>Relevance to performance</i> - Using a directing process, at least 20% of the insight from the lessons learned data base is being revisited	<i>Relevance to performance</i> - Insight gathered from the results of debriefing processes is implemented with the relevant functions	<i>Long term value</i> - The ratio between documents saved in common versus private locations is increasing
Retrieving and Re-Using Existing Knowledge	<i>Programme performance</i> - The competence centers of the division have been identified	<i>Long term value</i> - Most of the section leaders are aware of the business and technological knowledge managed within the company	<i>Management support</i> - The performance of managed competence centers is improving and the division's management initiates additional centers to be managed	<i>Relevance to performance</i> - The initiative for the mapping and documenting of knowledge for the competence centers is at the directorate level	<i>Relevance to performance</i> - The company's technological and business knowledge base are being used within the division
	<i>Programme performance</i> - The average monthly rate for the retrieval of existing knowledge is 1 for every 100 workers	<i>Programme performance</i> - The average monthly rate for the retrieval of existing knowledge is 2 for every 100 workers	<i>Programme performance</i> - The average monthly rate for the retrieval of existing knowledge is 5 for every 100 workers	<i>Programme performance</i> - The average monthly rate for the retrieval of existing knowledge is 8 for every 100 workers	<i>Programme performance</i> - The average monthly rate for the retrieval of existing knowledge is 10 for every 100 workers
	<i>Relevance to performance</i> - The division's director of knowledge has briefed the directors about the company's business and technological data bases	<i>Programme performance</i> - Training for the usage of the federated search engine have been conducted	<i>Relevance to performance</i> - The division's technology data base which aggregates the competence centers and the division's business data base are tied to their appropriate company database	<i>Relevance to performance</i> - The knowledge base for the preparation of price proposals is maintained and is updated	
Creating New Knowledge	<i>Long term value</i> - Knowledge created along the NPI process is identified as basis for reuse	<i>Relevance to performance</i> - Lessons learned from previous projects are presented to the division and company	<i>Relevance to performance</i> - Lessons learned from previous projects are reused within actual projects	<i>Relevance to performance</i> - Knowledge from previous project is being reused and the resulting value is recognized	<i>Long term value</i> - Managing knowledge through the NPI process is implemented in non technological projects as well

	<i>Programme performance</i> - The approved innovative ideas have been mapped as basis for newly created knowledge	<i>Programme performance</i> - There is a methodology to generalize innovative ideas so that they can be used across the company	<i>Relevance to performance</i> - Innovative ideas are identified as a source of new knowledge and presented as such in the division	<i>Relevance to performance</i> - New knowledge is documented and being put into usage within the everyday operational activity	<i>Relevance to performance</i> - We implement innovative ideas initiated in other divisions
Sharing Knowledge	<i>Long term value</i> - The number of workers belonging to communities is constantly increasing as well as the number of communities	<i>Programme performance</i> - The division is leading at least one multi-divisional community and the number of division participants in multi-divisional communities is constantly increasing	<i>Long term value</i> - The communities participants are satisfied enough to keep coming and the division is leading at least 3 multi-divisional communities	<i>Relevance to performance</i> - Communities are creating new knowledge (as good practices)	<i>Relevance to performance</i> - The communities throughput is recognized as contributing value to the division
	<i>Long term value</i> - Good practices are identified to be mapped and proposed across the company	<i>Programme performance</i> - Training for the derivation of good practices in the division's competence centers and in the communities	<i>Long term value</i> - Good practices are proposed across the company	<i>Relevance to performance</i> - Good practices proposed by other divisions are being reviewed and feedback is being transferred to their originators	<i>Relevance to performance</i> - Good practices recommended by other divisions are being implemented on a regular basis
	<i>Relevance to performance</i> - The division's site is recognized as a location for mutual sharing of knowledge and its internal customers are identified	<i>Programme performance</i> - Training for the effective usage of the company sites was conducted	<i>Programme performance</i> - The division's site is being automatically monitored by Web Trend or by a similar package	<i>Relevance to performance</i> - The number of users of the division's site for the purpose of seeking knowledge on a daily and weekly basis is constantly increasing	<i>Relevance to performance</i> - Knowledge from the division's site is being used by other divisions

Appendix 9: Self and mutual assessment results

Division	S/A 2003	M/A 2003	Objectivity 2003	Management 2003	Capturing 2003	Retrieving 2003	Creating 2003	Sharing 2003	S/A 2004	M/A 2004	Objectivity 2004	M/A Improvement	Management 2004	Capturing 2004	Retrieving 2004	Creating 2004	Sharing 2004	Q DK M	Q GM
L	0.99	0.72	0.73	0.93	1.35	2.00	1.40	0.50	4.4	1.97	0.45	274%	2.67	2	1.34	2.5	1.33	+	
E	0.78	0.41	0.53	0.38	0.50	1.00	0.75	0.40	3	1.5	0.50	366%	1.67	1.5	1.33	2	1	+	
A	0.98	0.71	0.72	0.73	0.70	1.25	0.60	1.67	1.5	1.47	1	207%	2	1	1	1	1.3	+	+
D	0.57	0.28	0.49	0.28	0.20	0.50	0.40	1.15	1.6	1.3	0.81	464%	1.67	1.5	1.33	1	1	+	+
S	0.21	0.3	1.43	0.55	1.30	0.50	0.00	0.00	1.67	1.3	0.78	433%	1.67	1.5	1	0.5	1	+	+
B	1.25	0.54	0.43	0.75	1.00	1.05	0.90	0.25	0	1.07		198%	1.67	1.5	1	0.5	0.67	+	+
F	0	0							4.7	0.93	0.20		0.67	0.5	0.67	1.5	1.33		+
N	1.15	0.66	0.57	0.85	0.55	0.86	0.60	0.95	1.9	0.93	0.49	141%	1	1	1	1	0.67	+	+
J	1.08	0.49	0.45	0.35	1.18	0.85	0.85	0.35	1.9	0.87	0.46	178%	0.67	0.5	0.67	0.5	0.67	+	+
M	0.88	0.51	0.58	1.23	0.50	0.50	0.15	0.00	0.46	0.87	1.89	171%	0.67	1	0.67	0.5	0.33	+	+
O	0.89	0.42	0.47	0.55	0.25	0.50	0.90	1.50	1.9	0.87	0.46	207%	1	0.5	0.67	1	0.67	+	+
H	0.41	0.49	1.20	0.50	0.35	1.43	1.50	0.55	2.9	0.73	0.25	149%	0.67	0.5	0.67	1.5	0.33	+	
T	0.61	0.27	0.44	0.25	0.50	0.30	0.00	0.30	0.7	0.7	1.00	259%	0.67	0.5	0.67	0.5	0.33	+	+
U	0.48	0.54	1.13	1.15	0.50	0.50	0.30	0.30	0.6	0.7	1.17	130%	1	0.5	0.33	1	0.67	+	+
Q	0.2	0.11	0.55	0.20	0.00	0.50	0.00	0.40	1.2	0.67	0.56	609%	1	0.5	0.67	0.5	0.67		
V	0.95	0.41	0.43	0.35	0.65	0.75	1.05	0.35	0	0.67		163%	0.33	0.5	1.33	0.5	0.67		+
C	0.31	0.28	0.90	0.40	0.25	1.40	0.30	0.30	0.87	0.57	0.66	204%	1	0.5	0.67	0	0.33		+
W	0	0							2	0.53	0.27		0.67	1	0.67	0	0.33	+	
K	0.36	0.21	0.58	0.50	0.45	0.30	0.50	0.00	0	0.5		238%	0.33	0	0.67	0.5	0.67	+	+
P	0.98	0.5	0.51	1.15	0.10	0.73	0.25	0.25	1.7	0.47	0.28	94%	0.67	0	0.67	1	0	+	+
I	0	0							4	0.23	0.06		0	0	0.33	0.5	0.33		+
G	0.99	0.42	0.42	0.33	0.70	0.50	0.70	0.54	0	0			0	0	0	0	0		+
R	0.44	0.25	0.57	0.50	0.10	0.80	0.55	0.30	0	0			0	0	0	0	0		
Average	0.73	0.43	0.66	0.60	0.56	0.81	0.59	0.50	2.06	0.90	0.62	211%	1.03	0.79	0.83	0.86	0.68		
Legend:	Objectivity between 0.8 and 1.2					0 - No Assessment			Q-Question		Minimum		Under average		Above average			Maximum	

Appendix 10: The GM questionnaire

Questionnaire relating to your activity in the performance of KM in your division as directed by IAI during the year 2004 (the questions refer to you personally and not to the division).

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
	1. Why are you performing KM?					
	1.1 As related to corporate					
Corporate demand	1.1.1 Because top corporate management recognizes and supports knowledge management efforts (2C)	1	2	3	4	Na
Corporate demand	1.1.2 Because you are dependent on corporate for the performance of KM? (2B)	1	2	3	4	Na
Corporate demand	1.1.3 Because KM is related to other corporate activity performed in the division? (2E)	1	2	3	4	Na
Corporate demand	1.1.4 Because your KM activity is affecting other corporate commitments? (2D)	1	2	3	4	Na
	1.2 As related to the division's performance					
Perception of relevance	1.2.1 To implement new or better ways of working (3C)	1	2	3	4	Na
Perception of relevance	1.2.2 To improve learning/ adaptation capability (3D)	1	2	3	4	Na
Perception of relevance	1.2.3 To improve employee skills (3B)	1	2	3	4	Na
Perception of relevance	1.2.4 To improve operational processes and your competitive advantage (4B)	1	2	3	4	Na
Perception of relevance	1.2.5 Because it gives you better customer handling (4D)	1	2	3	4	Na
Perception of relevance	1.2.6 To enable better decision making (3E)	1	2	3	4	Na
Perception of relevance	1.2.7 Because it gives you faster response to key business issues (4C)	1	2	3	4	Na
Perception of relevance	1.2.8 To promote a leading position in process knowledge within the company (5C)	1	2	3	4	Na
Perception of relevance	1.2.9 To identify experts in a subject matter (4E)	1	2	3	4	Na
	1.3 As related to the division's operational and business results					
Perception of relevance	1.3.1 To manage customer knowledge to increase value to customers and their loyalty (6B)	1	2	3	4	Na
Perception of relevance	1.3.2 Because it gives you reduced costs (6D)	1	2	3	4	Na
Perception of relevance	1.3.3 Because it gives you improved productivity (6C)	1	2	3	4	Na
Perception of relevance	1.3.4 Because it enhances product or service quality (6E)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Perception of relevance	1.3.5 To increase market share, and size and to help you recognise different market types (7B)	1	2	3	4	Na
Perception of relevance	1.3.6 Are you looking for return on investment of KM efforts in terms of results measures (7C)	1	2	3	4	Na
Corporate demand	1.3.7 Because KM accomplishments are published (7E)	1	2	3	4	Na
Corporate demand	1.3.8 The criteria for measuring success are based on your organization's mission, objectives, and goals and KM is part of them (7D)	1	2	3	4	Na
Perception of relevance	1.3.9 Was the division's general business situation generally satisfactory on the average during the evaluation period? (8B)	1	2	3	4	Na
Perception of relevance	1.3.10 Did it affect positively the implementation of the KM program (maybe because you had enough activity to base it on)? (8C)	1	2	3	4	Na
Perception of relevance	1.3.11 Did it affect negatively the implementation of the KM program (maybe because you didn't have time for it)? (8D)	1	2	3	4	Na
Perception of relevance	1.3.12 Was the division's general business situation generally not satisfactory on the average during the evaluation period? (9B)	1	2	3	4	Na
Perception of relevance	1.3.13 Did it affect positively the implementation of the KM program (maybe because you had enough bad experience you could use as basis for improvement)? (9C)	1	2	3	4	Na
Perception of relevance	1.3.14 Did it affect negatively the implementation of the KM program (maybe because pressure was on shorter term results than a KM program can provide)? (9D)	1	2	3	4	Na
	1.4 Because KM is known to ...					
Long term values	1.4.1 To increase innovation (10D)	1	2	3	4	Na
Long term values	1.4.2 To enhances your ability to develop and deliver knowledge-based goods or services (10E)	1	2	3	4	Na
Long term values	1.4.3 To enhance your division's intellectual capital (10C)	1	2	3	4	Na
Long term values	1.4.4 To improve your new product introduction (NPI) process (10B)	1	2	3	4	Na
Long term values	1.4.5 To improve your ability of standing up to the CMMI standards (11B)	1	2	3	4	Na
Long term values	1.4.6 To improve staff attraction and retention (11E)	1	2	3	4	Na
	1.5 Because you are convinced that ...					
Abstract values	1.5.1 Do you trust the principles promised by KM? (12B)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
KM plan & organisation	1.5.2 Do you think it only pertains to technological activity? (12C)	1	2	3	4	Na
KM plan & organisation	1.5.3 Do you believe it has to be led by dedicated people? (12E)	1	2	3	4	Na
KM plan & organisation	1.5.4 Do you believe it has to be led by people in various positions? (13E)	1	2	3	4	Na
KM plan & organisation	1.5.5 Do you think it applies to all levels of employees? (13D)	1	2	3	4	Na
KM plan & organisation	1.5.6 Do you think it is applicable only to management)? (12D)	1	2	3	4	Na
	2 What are you doing on behalf of KM performance?					
	2.1 Leading					
Abstract values	2.1.1 Do you consider it your task to establish an enterprise of knowledge culture? (2G)	1	2	3	4	Na
Abstract values	2.1.2 Do you consider it your task to establish a culture of continuous learning? (3G)	1	2	3	4	Na
Abstract values	2.1.3 Do you consider it your task to establish an environment of sharing? (4G)	1	2	3	4	Na
Long term values	2.1.4 Is promoting your division to a leading position in the process knowledge within the company one of your goals? (2H)	1	2	3	4	Na
	2.2 Coaching					
Perception of relevance	2.2.1 Is there awareness for division-specific and product-specific knowledge within the division, are these cultivated, and are they used to enhance the division's intellectual property? (5G)	1	2	3	4	Na
Perception of relevance	2.2.2 Have you established incentives (not necessarily material) to motivate employees to perform KM (such as aligning rewards and performance evaluation with KM, spotlighting top players)? (6G)	1	2	3	4	Na
Perception of relevance	2.2.3 Are you active in identifying critical knowledge, leading the activity needed to capture it, or encouraging your employees to participate in it? (4H)	1	2	3	4	Na
Perception of relevance	2.2.4 Are you active in establishing and leading competence centres, or encouraging your employees to participate in them? (5H)	1	2	3	4	Na
Perception of relevance	2.2.5 Are you active in establishing and leading innovation activity, or encouraging your employees to participate in it? (6H)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Perception of relevance	2.2.6 Are you active in establishing and leading multi-divisional communities of practice, or encouraging your employees to participate in them? (7H)	1	2	3	4	Na
Long term values	2.2.7 Do you encourage your employees to practice knowledge acquisition by participating in collaborative acquisition (such as communities of practice outside the company, conventions which have to be documented afterwards)? (8H)	1	2	3	4	Na
Connection to agenda	2.2.8 Are you dealing with your division's business knowledge, along all its life cycle (capturing, creating and documenting it, retrieving it for reuse and sharing it)? (9H)	1	2	3	4	Na
Connection to agenda	2.2.9 Are you dealing with your division's operational knowledge, along all its life cycle (capturing, creating and documenting it, retrieving it for reuse and sharing it)? (10H)	1	2	3	4	Na
2.3 Managing						
KM plan & organisation	2.3.1 Do you have an overall plan for the establishment of the infrastructure needed for KM (such as nominating the people in charge, having a plan for the implementation and its monitoring process)? (11G)	1	2	3	4	Na
Connection to agenda	2.3.2 Do you seek out people's know-how, know-what and know-why (and you don't contend just with the Know-Who)? (11H)	1	2	3	4	Na
Connection to agenda	2.3.3 Do you practice knowledge acquisition by directing competence centres to monitor technological advances? (12H)	1	2	3	4	Na
Connection to agenda	2.3.4 Do you direct practicing inside and outside reusing? (13H)	1	2	3	4	Na
Connection to agenda	2.3.5 Do you reuse mainly by recalling from a technological repository (such as the Product Data Memory, the Technical Information Centre, the logistical or financial data-bases, or the Competence Centres Intranet sites in any division)? (14H)	1	2	3	4	Na
Connection to agenda	2.3.6 Do you reuse mainly by recalling from a non-technological repository (such as the Business Information Centre, the division's business site, or the divisions' Lessons Learned sites)? (15H)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Connection to agenda	2.3.7 Do you direct the generation of new knowledge through collaboration (such as communities of practice, brainstorming sessions)? (16H)	1	2	3	4	Na
Consideration of division as self-contained	2.3.8 Do you practice knowledge acquisition by soliciting knowledge from external sources (such as advice/perceptions from customers, suppliers, or consultants, or by reviewing professional literature)? (12G)	1	2	3	4	Na
	2.4 Lecturing					
Connection to agenda	2.4.1 Are you communicating KM at all levels of personnel? (17G)	1	2	3	4	Na
Perception of relevance	2.4.2 Are you lecturing about KM only on scheduled events? (17H)	1	2	3	4	Na
Connection to agenda	2.4.3 Are you lecturing about KM only on events dedicated to values and the competitive advantage initiative? (18H)	1	2	3	4	Na
Connection to agenda	2.4.4 Do you take pride at your division's KM accomplishments (such as lecture about it outside the division)? (18G)	1	2	3	4	Na
	2.5 Educating					
Connection to agenda	2.5.1 Are courses for values as sharing, innovation, or reuse conducted in your organisation? (19G)	1	2	3	4	Na
Connection to agenda	2.5.2 Do you explain KM to employees (such as communicating the results of activities, making the concepts real, using successful practices as examples, demonstrating the individual and group value of shared knowledge)? (20G)	1	2	3	4	Na
Connection to agenda	2.5.3 Do you support training for specific KM activities? (19H)	1	2	3	4	Na
	2.6 Monitoring					
Program Monitoring	2.6.1 Is there a monitoring process established in the division for the KM program? (21G)	1	2	3	4	Na
Program Monitoring	2.6.2 Are you leading it personally? (22G)	1	2	3	4	Na
Program Monitoring	2.6.3 Is its rate and intensity based on results? (23G)	1	2	3	4	Na
Program Monitoring	2.6.4 Is there a monitoring process established in the directorates for the KM program? (24G)	1	2	3	4	Na
Program Monitoring	2.6.5 Is it meant to assess the impact KM performance has on operational or business results? (21H)	1	2	3	4	Na
	3 How are you performing KM?					
	3.1 As specified by the KM handbook					
Management support	3.1.1 Do you support the KM program? (26G)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Long term values	3.1.2 Are you preaching documenting in an organised way, enabling it to be reused and shared, as part of everyday work processes? (26H)	1	2	3	4	Na
Connection to agenda	3.1.3 Do you use the division's Intranet site for formal internal publishing (such as posting directives, lessons learned/best practices to be used)? (27H)	1	2	3	4	Na
Connection to agenda	3.1.4 Do you use the division's Intranet site for informal internal publishing (such as posting an idea to encourage involvement in general or innovation specifically)? (28I)	1	2	3	4	Na
Connection to agenda	3.1.5 Are you using human mobility as a mean of transferring knowledge? (27I)	1	2	3	4	Na
Long term values	3.1.6 Are you learning from observing failed/successful efforts in your division or in others (through using the lessons learned sites across the company)? (28I)	1	2	3	4	Na
Connection to agenda	3.1.7 Are you including suppliers or customers in internal meetings to gather a different perception than the division's? (26J)	1	2	3	4	Na
Long term values	3.1.8 Are you active in improving processes through process analysis? (27G)	1	2	3	4	Na
Long term values	3.1.9 Are you active in enhancing the division's intellectual property (such as obtaining patents)? (29I)	1	2	3	4	Na
Long term values	3.1.10 Do you advocate sharing other's good practices? (28G)	1	2	3	4	Na
Long term values	3.1.11 Do you advocate sharing your good practices with others? (29G)	1	2	3	4	Na
KM plan & organisation	3.1.12 Are you empowering the KM manager you have appointed with the responsibility and authorization, authority and resources to enforce the KM program in the division and to empower the employees to share their knowledge? (28H)	1	2	3	4	Na
KM plan & organisation	3.1.13 Is there an established KM organisation beyond the knowledge manager and are you satisfied with the way it functions? (29H)	1	2	3	4	Na
Program Monitoring	3.1.14 Are you active measuring knowledge resources (such as knowing what the organization already knows, creating and cataloguing the organisation's memory, performing knowledge audits)? (27J)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Program Monitoring	3.1.15 Do you measure the effects of KM (such as linking KM to specific processes to discover direct impacts, measuring time, money and personnel time saved)? (28J)	1	2	3	4	Na
	3.2 As you interpret the KM directive					
Management support	3.2.1 Do you show you support the KM program explicitly? (30G)	1	2	3	4	Na
Connection to agenda	3.2.2 Do you rely on meetings to transfer knowledge all the way through the hierarchy ladder? (30I)	1	2	3	4	Na
Connection to agenda	3.2.3 Do you use e-mail for formal internal publishing? (31G)	1	2	3	4	Na
Management support	3.2.4 Do you openly recognise KM doers? (32G)	1	2	3	4	Na
Management support	3.2.5 Are you active increasing employees' empowerment? (30H)	1	2	3	4	Na
Long term values	3.2.6 Do you have an active program for the promotion of innovation in the division? (30J)	1	2	3	4	Na
Connection to agenda	3.2.7 Do you consider KM aligned with business strategies (such as developing intellectual asset tactics and strategy to support business strategy, relate intellectual property to business use, focusing the KM vision and practice to support and align with enterprise strategy and direction, embedding KM in the business model)? (33G)	1	2	3	4	Na
Long term values	3.2.8 Do you believe KM can improve internal communication within the organization? (31J)	1	2	3	4	Na
Long term values	3.2.9 Do you believe KM can improve internal collaboration within the organization? (32J)	1	2	3	4	Na
Connection to agenda	3.2.10 How much is the knowledge management effort adequately funded? (33J)	1	2	3	4	Na
Connection to agenda	3.2.11 Do you ask functional managers to participate in knowledge management efforts? (31H)	1	2	3	4	Na
	3.3 Relying on experts					
Consideration of division as self-contained	3.3.1 Do you rely on experts external to the division, for KM technological implementation? (34I)	1	2	3	4	Na
Consideration of division as self-contained	3.3.2 Do you rely on experts external to the division, for KM procedural implementation? (34J)	1	2	3	4	Na
	3.4 Intuitively					
Perception of relevance	3.4.1 Do you think you perform KM without calling it as such? (35G)	1	2	3	4	Na
KM plan & organisation	3.4.2 Have you creatively added to the established KM program any additional content? (36G)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
	4 When are you performing KM?					
	4.1 In case of crisis					
Connection to agenda	4.1.1 Do you see a role to the knowledge managers or leaders in a case of emergency (or do you consider their task too remote and long term)? (15B)	1	2	3	4	Na
Connection to agenda	4.1.2 Would you include the knowledge manager or leaders at standing morning meetings? (15C)	1	2	3	4	Na
Connection to agenda	4.1.3 In case of an emergency (for generating an urgent proposal, for debriefing a malfunction or a customer complain)? (15D)	1	2	3	4	Na
	4.2 To avert danger					
Perception of relevance	4.2.1 Do you believe you can minimize faults by reusing lessons learned? (16B)	1	2	3	4	Na
	4.3 Connected to events					
Connection to agenda	4.3.1 Would you require involving the knowledge manager or leaders in the preparation of an important bid, in the IPT of an important project at the evaluation stage or in any other significant event? (17B)	1	2	3	4	Na
Connection to agenda	4.3.2 Would you include the knowledge manager or leaders at project kick-off meetings? (17C)	1	2	3	4	Na
Connection to agenda	4.3.3 Would you include the knowledge manager or leaders at the projects monitoring meeting? (18C)	1	2	3	4	Na
Connection to agenda	4.3.4 Would you include the knowledge manager or leaders at festive event occasions (such as successful test, project delivery)? (19C)	1	2	3	4	Na
KM plan & organisation	4.3.5 Ahead of retiring senior employees? (19D)	1	2	3	4	Na
	4.4 Regardless of occasion					
Management Support	4.4.1 Do you take active part in KM events not only as an invited manager? (20B)	1	2	3	4	Na
Connection to agenda	4.4.2 Would you include the knowledge manager or leaders at staff meetings? (20C)	1	2	3	4	Na

Appendix 11: The DKM questionnaire

Questionnaire relating to your activity in the performance of KM in your division as directed by IAI during the year 2004 (the questions refer to you personally and not to the division)

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
	1. Why are you performing KM?					
	1.1 As related to the GM					
Management support	1.1.1 Because the GM recognizes and supports KM efforts (2C)	1	2	3	4	Na
Position in organisation	1.1.2 Are you dependent on the GM for the performance of KM? (2B)	1	2	3	4	Na
Other activities complementary	1.1.3 Is the other activity you are responsible for influenced by KM? (2D)	1	2	3	4	Na
Other activities complementary	1.1.4 Is KM influenced by the other activity you are responsible for? (3C)	1	2	3	4	Na
Other activities complementary	1.1.5 Do you believe KM and QM are interrelated? (2E)	1	2	3	4	Na
Other activities complementary	1.1.6 Do you believe KM and HR are interrelated? (3E)	1	2	3	4	Na
Other activities complementary	1.1.7 Do you believe KM and IT are interrelated? (4E)	1	2	3	4	Na
Other activities complementary	1.1.8 Do you believe KM and Change are interrelated? (5E)	1	2	3	4	Na
Management support	1.1.9 Is the GM looking for return on investment of KM efforts in terms of result measures? (4C)	1	2	3	4	Na
	1.2 As related to the division's performance					
Relation to division performance	1.2.1 To implement new or better ways of working (6C)	1	2	3	4	Na
Relation to division performance	1.2.2 To improve operational processes and the division's competitive advantage (6B)	1	2	3	4	Na
Relation to division performance	1.2.3 To enable better decision making (6E)	1	2	3	4	Na
Enabler for career building	1.2.4 To promote a leading position to the division in process knowledge within the company (7C)	1	2	3	4	Na
Relation to division performance	1.2.5 To identify experts in a subject matter (7E)	1	2	3	4	Na
Program communication	1.2.6 Using throughput measures helps you in "selling" the program to people who have to implement it (6D)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Program communication	1.2.7 Is the division's organisation, within the overall matrix arrangement, mainly technology proficiency oriented and does it help the knowledge sharing potential and the value of the intellectual property? (8C)	1	2	3	4	Na
	1.3 As related to the division's operational and business results					
Relation to division performance	1.3.1 To manage customer knowledge to increase value to customers and their loyalty (8B)	1	2	3	4	Na
Relation to division performance	1.3.2 To enable improving productivity (8C)	1	2	3	4	Na
Relation to division performance	1.3.3 To enhance product or service quality (8E)	1	2	3	4	Na
Relation to division performance	1.3.4 Are you looking for return on investment of KM efforts in terms of result measures (10E)	1	2	3	4	Na
Enabler for career building	1.3.5 Because KM accomplishments are published (9E)	1	2	3	4	Na
Enabler for career building	1.3.6 The criteria for measuring your success depends on KM performance (8D)	1	2	3	4	Na
Program performance	1.3.7 Was the division generally busy during the evaluation period? (9B)	1	2	3	4	Na
Program performance	1.3.8 Did it affect positively the implementation of the KM program (maybe because there was enough activity to base it on)? (9C)	1	2	3	4	Na
Program performance	1.3.9 Did it affect negatively the implementation of the KM program (maybe because there wasn't time for it)? (9D)	1	2	3	4	Na
Program performance	1.3.10 Was the division generally not busy during the evaluation period? (10B)	1	2	3	4	Na
Program performance	1.3.11 Did it affect positively the implementation of the KM program (maybe because there was enough bad experience you could use as basis for improvement)? (10C)	1	2	3	4	Na
Program performance	1.3.12 Did it affect negatively the implementation of the KM program (maybe because pressure was on shorter term results than a KM program can provide)? (10D)	1	2	3	4	Na
Relation to division performance	1.3.13 Using business result measures helps you in "selling" the program to management (11E)	1	2	3	4	Na
	1.4 Because KM is known to ...					
Long term values	1.4.1 To increase innovation (12D)	1	2	3	4	Na
Long term values	1.4.2 To enhances the division's ability to develop and deliver knowledge-based goods or services (12E)	1	2	3	4	Na
Long term values	1.4.3 To enhance your division's intellectual capital (12C)	1	2	3	4	Na
Long term values	1.4.4 To improve the division's new product introduction (NPI) process (12B)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Long term values	1.4.5 To improve the division's ability of standing up to the CMMI standards (13B)	1	2	3	4	Na
Long term values	1.4.6 To improve staff attraction and retention (13E)	1	2	3	4	Na
	1.5 Because you are convinced that ...					
Long term values	1.5.1 Do you trust the virtues of KM? (14B)	1	2	3	4	Na
Long term values	1.5.2 Would you limit KM only to technological activity? (14C)	1	2	3	4	Na
Position in organisation	1.5.3 Do you believe KM has to be led by people dedicated only to KM? (14E)	1	2	3	4	Na
Position in organisation	1.5.4 Do you believe the managerial position of people leading KM is important? (15E)	1	2	3	4	Na
Position in organisation	1.5.5 Do you think KM applies to all levels of employees? (15D)	1	2	3	4	Na
Position in organisation	1.5.6 Do you think KM is applicable only to management? (14D)	1	2	3	4	Na
	2 What are you doing on behalf of KM performance?					
	2.1 Leading					
Personal and professional profile	2.1.1 Do you consider it your task to enhance knowledge culture in the division? (2G)	1	2	3	4	Na
Personal and professional profile	2.1.2 Do you consider it your task to enhance a culture of continuous learning in the division? (3G)	1	2	3	4	Na
Personal and professional profile	2.1.3 Do you consider it your task to enhance sharing in the division? (4G)	1	2	3	4	Na
Enabler for career building	2.1.4 Is promoting your division to a leading position in process knowledge within the company one of your goals? (2H)	1	2	3	4	Na
Enabler for career building	2.1.5 Do you believe you can lead a program without being officially the director of the people you are leading? (3H)	1	2	3	4	Na
Initiative	2.1.6 Are you active in securing sponsorship (such as obtaining management buy-in, making sure management understands and is ready to promote KM)? (5G)	1	2	3	4	Na
	2.2 Coaching					
Relation to division performance	2.2.1 Is there awareness for division-specific and product-specific knowledge within the division, are these cultivated, and are they used to enhance the division's intellectual property? (5G)	1	2	3	4	Na
Relation to division performance	2.2.2 Do you believe incentives can help motivate employees to perform KM (such as aligning rewards and performance evaluation with KM, spotlighting top players and not necessarily material)? (6G)	1	2	3	4	Na
Program performance	2.2.3 Are you active in identifying critical knowledge, leading the activity needed to capture it, or encouraging employees to participate in it? (5H)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Program performance	2.2.4 Are you active in establishing and leading competence centres, or encouraging employees to participate in them? (6H)	1	2	3	4	Na
Initiative	2.2.5 Are you active in establishing and leading innovation activity, or encouraging employees to participate in it? (7H)	1	2	3	4	Na
Program performance	2.2.6 Are you active in establishing and leading multi-divisional communities of practice, or encouraging employees to participate in them? (8H)	1	2	3	4	Na
Initiative	2.2.7 Do you encourage employees to practice knowledge acquisition by participating in collaborative acquisition (such as communities of practice outside the company, documented convention participation)? (9H)	1	2	3	4	Na
Relation to division performance	2.2.8 Are you dealing with knowledge items, along all their life cycle (capturing, creating and documenting it, retrieving it for reuse and sharing it) rather than dealing with each action by itself? (10H)	1	2	3	4	Na
2.3 Managing						
Position in organisation	2.3.1 Are you in a position to direct KM performance? (11G)	1	2	3	4	Na
Position in organisation	2.3.2 Do you maintain the establishment of the infrastructure needed for KM (such as managing the knowledge leaders, having a plan for the implementation and its monitoring process)? (12G)	1	2	3	4	Na
Initiative	2.3.3 Do you seek out people's know-how, know-what and know-why (and you don't contend just with the Know-Who)? (11H)	1	2	3	4	Na
Program performance	2.3.4 Do you encourage practicing inside and outside reusing? (12H)	1	2	3	4	Na
Program performance	2.3.5 Is reuse mainly practised by recalling from a technological repository (such as the Product Data Memory, the Technical Information Centre, the logistical or financial data-bases, or the Competence Centres Intranet sites in any division)? (13H)	1	2	3	4	Na
Program performance	2.3.6 Is reuse mainly practised by recalling from a non-technological repository (such as the Business Information Centre, the division's business site, or the divisions' Lessons Learned sites)? (14H)	1	2	3	4	Na
Program performance	2.3.7 Is new knowledge generated mainly from the project activity? (15H)	1	2	3	4	Na
Program performance	2.3.8 Is new knowledge generated mainly from the innovation activity? (16H)	1	2	3	4	Na
Initiative	2.3.9 Do you encourage knowledge acquisition by soliciting knowledge from external sources (such as advice/perceptions from customers, suppliers, or consultants, or by reviewing professional literature)? (13G)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
	2.4 Lecturing					
Program communication	2.4.1 Are you communicating KM at all levels of personnel? (17G)	1	2	3	4	Na
Program communication	2.4.2 Are you lecturing about KM mainly on scheduled events? (17H)	1	2	3	4	Na
Program communication	2.4.3 Are you lecturing about KM mainly on events dedicated to values and the competitive advantage initiative? (18H)	1	2	3	4	Na
Enabler for career building	2.4.4 Do you take pride at your division's KM accomplishments (such as lecturing about it outside the division)? (18G)	1	2	3	4	Na
	2.5 Educating					
Program communication	2.5.1 Are lectures about values such as sharing, innovation, or reuse given in your organisation? (19G)	1	2	3	4	Na
Program communication	2.5.2 Do you explain KM to employees (such as communicating the results of activities, making the concepts real, using successful practices as examples, demonstrating the individual and group value of shared knowledge)? (20G)	1	2	3	4	Na
Program communication	2.5.3 Do you believe training for specific KM activities can be useful? (19H)	1	2	3	4	Na
	2.6 Monitoring					
Program Monitoring	2.6.1 Is there a monitoring process established in the division for the KM program? (21G)	1	2	3	4	Na
Program Monitoring	2.6.2 Is the division's management involved in it? (22G)	1	2	3	4	Na
Program Monitoring	2.6.3 Is its rate and intensity based on the division's operational results? (23G)	1	2	3	4	Na
Program Monitoring	2.6.4 Is its rate and intensity based on the KM performance results? (21H)	1	2	3	4	Na
Program Monitoring	2.6.5 Is there a monitoring process established in the directorates for the KM program? (24G)	1	2	3	4	Na
Relation to division performance	2.6.6 Is it meant to assess the impact KM performance has on operational or business results? (22H)	1	2	3	4	Na
	3 How are you performing KM?					
	3.1 As specified by the KM handbook					
Management support	3.1.1 Is the GM actively supporting the KM program? (26G)	1	2	3	4	Na
Program communication	3.1.2 Is the division's Intranet site mainly used for formal internal publishing (such as posting directives, lessons learned/best practices to be used)? (26I)	1	2	3	4	Na
Program communication	3.1.3 Is the division's Intranet site mainly used for informal internal publishing (such as posting an idea to encourage involvement in general or innovation specifically)? (26J)	1	2	3	4	Na
Program communication	3.1.4 Are you encouraging people to learn from observing failed/successful efforts in your division or in others (through using the lessons learned sites across the company)? (27I)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Initiative	3.1.5 Are you encouraging the including of suppliers or customers in internal meetings to gather a different perception than the division's? (28I)	1	2	3	4	Na
Initiative	3.1.6 Are you active in improving processes through process analysis? (27G)	1	2	3	4	Na
Initiative	3.1.7 Are you active in enhancing the division's intellectual property (such as obtaining patents)? (29I)	1	2	3	4	Na
Program performance	3.1.8 Do you advocate sharing other divisions' good practices? (28G)	1	2	3	4	Na
Program performance	3.1.9 Do you advocate sharing the division's good practices with others? (29G)	1	2	3	4	Na
Position in organisation	3.1.10 Do you feel empowered by the GM with the responsibility and authorization, authority and resources to enforce the KM program in the division? (26H)	1	2	3	4	Na
Position in organisation	3.1.11 Is there an established KM organisation beyond your appointment and are you satisfied with the way it functions? (27H)	1	2	3	4	Na
Initiative	3.1.12 Are you actively measuring knowledge resources (such as knowing what the organization already knows, creating and cataloguing the organisation's memory, performing knowledge audits)? (27J)	1	2	3	4	Na
Resource allocation	3.1.13 Do you allocate 20% of your time to KM? (30G)	1	2	3	4	Na
	3.2 As you interpret the KM directive					
Management support	3.2.1 Does the GM show he supports the KM program explicitly? (31G)	1	2	3	4	Na
Management support	3.2.2 Are KM doers openly recognised? (31J)	1	2	3	4	Na
Relation to division performance	3.2.3 Do you believe KM can improve internal communication within the organization? (31I)	1	2	3	4	Na
Resource allocation	3.2.4 Is the knowledge management effort adequately funded? (32J)	1	2	3	4	Na
Management support	3.2.5 Are directors participating in knowledge management efforts? (31H)	1	2	3	4	Na
Initiative	3.2.6 Do you consider KM as a recommendation only? (32G)	1	2	3	4	Na
	3.3 Relying on experts					
Personal and professional profile	3.3.1 Do you wish to rely on experts external to the division, for KM technological implementation? (33G)	1	2	3	4	Na
Personal and professional profile	3.3.2 Do you wish to rely on experts external to the division, for KM procedural implementation? (34G)	1	2	3	4	Na
Personal and professional profile	3.3.3 Do you believe the position of KM manager can be filled with a young person new to the company? (33J)	1	2	3	4	Na
Personal and professional profile	3.3.4 Do you believe the position of KM manager can be filled with an external employee of the company? (34J)	1	2	3	4	Na

Factor	1- Very much, 2- Yes, 3- Partially, 4- No, Not applicable					
Personal and professional profile	3.3.5 Do you believe the position of KM manager can be outsourced? (35J)	1	2	3	4	Na
	3.4 Intuitively					
Program performance	3.4.1 Do you think your division performs KM without calling it as such? (36G)	1	2	3	4	Na
Initiative	3.4.2 Have you creatively added to the established KM program any additional content? (37G)	1	2	3	4	Na
	4 When are you performing KM?					
	4.1 In case of crisis					
Program performance	4.1.1 Do you see a role to the knowledge managers or leaders in a case of emergency (or do you consider their task too remote and long term)? (18B)	1	2	3	4	Na
Program performance	4.1.2 Would you include the knowledge manager or leaders at standing morning meetings? (18C)	1	2	3	4	Na
	4.2 To avert danger					
Relation to division performance	4.2.1 Do you believe KM can minimize faults? (19D)	1	2	3	4	Na
Relation to division performance	4.2.2 Do you believe KM can maximize profit? (20D)	1	2	3	4	Na
	4.3 Connected to events					
Relation to division performance	4.3.1 Would you include the knowledge manager or leaders in the preparation of an important bid, in the IPT of an important project at the evaluation stage or in any other significant event? (21B)	1	2	3	4	Na
Relation to division performance	4.3.2 Would you include the knowledge manager or leaders at the projects monitoring meeting? (21C)	1	2	3	4	Na
Relation to division performance	4.3.3 Would you include the knowledge manager or leaders at festive event occasions (such as successful test, project delivery)? (21D)	1	2	3	4	Na
Relation to division performance	4.3.4 Are the knowledge manager or leaders relevant mainly ahead of corporate reviews or assessments? (22D)	1	2	3	4	Na
	4.4 Regardless of occasion					
Management support	4.4.1 Do you ask your GM to take active part in KM events not only as an invited manager? (23D)	1	2	3	4	Na
Position in organisation	4.4.2 Is it crucial for the knowledge manager to be part of the management staff of the division? (23C)	1	2	3	4	Na
Resource allocation	4.4.3 Do you allocate time to KM on a regular basis rather than responding to requests? (24C)	1	2	3	4	Na

Appendix 12: Sample of day-to-day KM interaction

Date	Interacting party	Content
02.04.01	DKM at D	Request for development of communication process between functions over local interest for personal inter-relationship involving HR
18.06.01	NIMRate team at H	Identification of activities to increase reuse using Cranfield model (Lettice and Young, 2002)
03.09.01	IT mgr. at N	Proposes to gather an 'Encyclopedia' of developed modules
03.09.01	Director at V	Proposes to develop a repository of price proposals
16.09.01	GM of A	Customer knowledge is prime information. Knowledge sharing is problematic due to internal competition. Reuse, only within department. Recognition to knowledge owners and not to sharers. Innovation only at the concept level. The rest is engineering.
18.10.01	VP of ABCDE group	Knowledge sharing between divisions based on personal acquaintanceship within professional circles.
21.01.02	VP for R&D	Personal and cultural aspects of KM more important than technological one. The DoK status is important.
14.02.02	Steering committee	Proposed KM procedures: Reuse, innovation, sharing, communities, competence centers, debriefing, intelligence, best practices, projects, capturing, documentation.
26.03.02	Innovation & technology committee	Project knowledge from the NPI process. Tools to diminish the cultural barrier. Recognition for documented knowledge. Publish best practices. Measure awareness for KM. DKM in each division.
02.07.02	Executive committee	Directive to nominate DKM for each division and corporate organization; to establish a KM Intranet site; DoK to present KM plan for approval
01.10.02	VP for R&D	Expects the steering committee to determine the knowledge considered as company's asset.
16.10.02	DKMs	DoK presentation of strategy and of alternative frameworks; DKMs to choose procedures.
11-12.02	DKMs	Procedure definition by 4 committees of DKMs for the 4 chapters: Needs, goals, processes, infrastructure, organization, creation of awareness, training, measures.

Date	Interacting party	Content
12.11.02	VP for R&D	Prioritize CoPs; pick from existing competence centres; differentiate between levels of CoPs (company, group, division); follow-up CoPs performance on a 6 months basis.
09.12.02	Steering committee	Reorganization to include T50 representatives from each group, HR and training organizations; request to establish technological CoPs.
10.12.02	DKMs	VP for R&D directs to focus on making knowledge an asset to be used by everyone; business and technological data-bases for inside information; debriefings and not inquiries; distribute the lessons learned; initiate technological CoPs; KM handbook is not optional; use PDM as a managing tool.
11.12.02	GM of P	Intends to nominate KLs per directorate and to create a data-bank of experts.
22.12.02	GM of U	Intends to nominate KLs for debriefing and for knowledge capture; needs company-wide yellow pages for organizational knowledge.
25.12.02	GM of V	Proposes to establish a CoP of IT programme managers; intends to concentrate in CoPs and debriefing; considers the help desk as a bank of knowledge.
25.12.02	DKM of K	Intends to promote business intelligence.
14.01.03	GM of Q	Needs KM for process mapping, project knowledge, knowledge retention, identifying and documenting problematic competence centers, marketing process documentation.
20.01.03	GM of R at staff meeting	Need to develop 'price list' for various tasks; requires process mapping and innovation incentives.
13.03.03	T17	VP for R&D reporting and getting reapproval of programme.
30.07.03	GM of A	Establishment of steering committee at division level; division N took example and did the same.
21.10.03	GM & DKM of U	Goal for 2004: Positioning U in company.
23.12.03	GM & DKM of S	Intention to create a database of insights from lessons learned through filtering committee; Have mapped the requirements for knowledge capture; DKM not known as such in division; goal for 2004: importing new product knowledge.
28.12.03	DKM of J	The nature of J's business is a very wide market with a very high reuse potential – basis for business database.

Appendix 13: Table shells

Factor		Issue	A	J	N	S	U
The division's GM							
Long term values		To increase innovation , improve NPI implementation, and standing to CMMI standards	Nomination of people in charge of all functions.	Organizing a team dedicated to innovation and to the promotion of new ideas.	Leads a periodic meeting with experienced people mixed with young and new employees to investigate new ideas.	Participates in at least one community of practice advocating innovative methods of testing.	
Management support	Management support	How is the division's GM supporting the programme and how does he show it?		The GM has assigned his deputy to follow-up the programme implementation.			
	Management support	Is there a practice of recognition and how is it used to enhance KM activity?		Recognition is practiced but hasn't yet for KM.			The GM calls does to staff meetings to present their deeds.
	Corporate demand	The attitude of the GM to corporate demand	Tries his best to be 'best in class'.	Aligns to corporate demands and complies with local applications.	Doesn't agree to the formalism of it.	Was member of the steering committee for the establishment of the programme	KM is considered as core to the division.
Perception of relevance		Perception of relevance: How is KM looked upon as a competitive advantage enabler?	Capturing knowledge from retiring employees.	Building a new site for one of the division's directorates.	Awareness to the importance of knowledge but not to KM.	Lessons learned diminished testing failures from 17.8% to 10%. Rework time from 4000 hrs to 1200 hrs.	
Quality of performance of the programme	KM organisation	How is the organisation of KM leaders in the various directorates helping the KM programme?	Steering committee nominated at the division level.	12 directorates nominated knowledge leaders but only 3 are active.	No KM leaders but division steering committee meets on a quarterly basis.	KM leaders nominated in engineering and quality assurance but not active.	Knowledge leaders nominated in all directorates.
	Programme monitoring	Is there a monitoring process for the KM programme and how is its rate and intensity established?	Asks for monthly progress report.	The programme is monitored on a bi-weekly basis by the DKM together with the change champion.		KM processes part of PDM4.	

Factor		Issue	A	J	N	S	U
Initiative	Connection to agenda	Connection to agenda: How are the operational and business division's agenda, driving the KM programme by prioritizing its activities?		KM is one of the required actions in the division PDM.	KM goals and actions as part of division's operational plans.	2 KM procedures linked to division goals.	
Division self perception	Consideration of division as self contained	Openness to external experts and to cooperation with other divisions; willingness to lead communities of practice	Openness within the group but not to divisions in other groups.	Dependent on other divisions for the integration of their systems.	Dependent on the business of other divisions who are dependent on their technology.	Business and technology peculiar to this division only.	Dependent of the knowledge of the other divisions (who sometimes self-supply the service.
The division knowledge manager							
Perception of relevance		Choice of throughput or business result measures	None	Knowledge assets created in competence centres.	Generation of innovative ideas; KM procedures are supporting division's goals.	Saving rework due to lessons learned and implemented.	None
Quality of performance of the programme	Programme performance	Procedures chosen to be implemented	Content management; technological database; project knowledge; sharing knowledge through the Intranet.	Lessons learned; competence centres; innovation; communities.	Knowledge capture; technological database; innovation; good practices.	Lessons learned; project knowledge.	Lessons learned; sharing knowledge through the Intranet.
	Programme communication	KM communication	Lectures to T1000	None	Part of quality meetings.	None	
DKM profile	Personal and professional profile	What is the knowledge manager's personal and professional profile and how does it help him perform?	Deputy director for engineering	Radar & EW integrator	Quality and change responsibility gives him a wider than normal point of view.	Deputy director Organisation & Information systems.	R&D and responsible for eLearning.
	Position in organization	Member of the management staff	T1000 yet member of the division's management staff.	No (T14000)	Yes (T300)	T1000 yet member of the division's management staff.	Yes (T300)

Factor		Issue	A	J	N	S	U
	Enabler for career building	Consideration of KM implementation as criteria for promotion	KM considered as part of task as promoter of working methods for engineering.	Only management task added to engineering activity and therefore considered as vehicle for promotion.	KM considered as part of task as promoter of working methods for engineering.		
	Are other activities complementary	QM, HR, Change champion, Engineering, R&D, IT?	QM, change and IT		Complementing the change champion task.	Complementing the IT manager task.	Complementing e-learning promotion.
Initiative	Initiative	How does the knowledge manager apply creatively the KM programme?	Organizing a Kaizen event for KM implementation.		Developing a tool for the capture of project knowledge.	Effort to implement a tool for the generation of insights out of lessons learned.	Established and published on the Intranet a Yellow Pages system of identification of people with proficiency in software solutions.
	Resource allocation	How is time allocated by the knowledge manager for the KM programme?	20% of his time on a regular basis.	20% of his time not on a regular basis.	25% of his time.	30% of his time and feels it is not enough.	
The division							
Division's business results		What was the division's general business situation during the evaluation period and how could this affect the implementation of the KM programme?	Generally busy and creating a load problem for the DKM.				
Specific knowledge		Is there awareness for company-specific and product-specific knowledge within the division, are these cultivated, and how is it used to enhance the division's intellectual property?	Yes in the view of the DKM.		Very proud of being the only engineering division in the company.		e-Learning as a way to capture and package knowledge.

Factor	Issue	A	J	N	S	U
Division's Organisation	Competence centres position: Is the division's organisation, within the overall matrix arrangement, mainly project oriented or technology proficiency oriented and how does it influence the knowledge sharing potential and the value of the intellectual property?	Mostly technology proficiency oriented to support projects of the group.	Vertically organized and project oriented.	Only technology proficiency oriented.	Only technology proficiency oriented.	Two main and separate activities within which there are different technologies. Central to the company and dependent on it.
Sharing practice	Sharing practices: How does the division generates routinely good practices for the benefit of the whole company?	Pride in telling what it does best.	Published expert list (duplicated in other divisions).	Developing engineering handbooks for the whole company's benefit.		
	How does the division practice inside and outside sharing ?	Would rather not share outside the division and definitely outside the group.	BI function to import business data from published knowledge. Transparency site with business and marketing data, travelling reports, and experts list.	The division's intranet site includes engineering tools and data-bases shared by all employees.		
Openness to lessons learned	How are lessons learned from the KM process gathered, shared and used across the division?	The DKM organised a Kaizen event in order to improve the publication and distribution of lessons learned.	Lessons learned are published to a limited audience.	Debriefing design failures. 19 improvement propositions but none generalized to be reused elsewhere.		
Innovation practice	How does the division promote a culture of innovation ?		Dedicated team and tool for the identification and promotion of innovation.			

Factor	Issue	A	J	N	S	U
Documentation practice	Documentation practice: Are documenting in an organised way, enabling it to be reused and shared, encrusted in everyday work processes?	Implementing an Intellectual Property data/base mainly for design in SW and electronics.		Knowledge capture in engineering handbooks.	Conducted a 3-day training session on debriefings. Debriefing after each overhaul is a practice.	Created a knowledge packaging tool for training and technical documentation.
Reuse practice	Reusing practice: How does the division practice inside and outside reusing?		Forum to analyse lessons learned from debriefings as published in division's site. Results are in reducing projects cost.	Publishing process standards, material standards, engineering data and processes guides on the Intranet.	Created a computerised tool for the management and generation of engine overhaul price proposals. Implemented a software for the analysis of accessories malfunctions (down from 4% to 0.8%).	

Appendix 14: Division J analysis

14.1 GM pattern

The author has used the distribution of GM questions by factors presented in table 6-6 to evaluate and comment upon the answers of the GM of division J. For example, his average answer to questions relating to perception of relevance was 2.1 while the average of all GMs was 2.28 (↑); and his average answer to questions relating to quality of performance was 2.85 while the average of all GMs was 2.72 (↓). The result, showing mainly positions different than the other GMs average, appears in table 14-1:

Factors	Why	What	How	When
Long term values  ↓	To enhance the division's intellectual capital and only partially as a promoter of innovation.	Reserved about considering it his task to promote the division to a leading process knowledge position.	Strong believer of the potential of lessons learned; active at enhancing the division's intellectual property; claiming sharing other's good practices as not relevant.	
Management support  ↓	Partially because required by corporate; denies relevance to publicity of results.		Claims he supports KM and shows it.	Claims participating in KM events.
Perception of relevance  ↑	To improve employees skills.	Active in encouraging employees to participate in communities of practice; doesn't consider it relevant to lecture about KM.		
Division self-perception  ↓		Open to external sources of knowledge.		
Quality of performance  ↓	Doesn't think it applies to all levels of employees.	Maintaining a monitoring process for KM, claimed not to be relevant with operational or business results and not leading it himself; planning for the KM infrastructure is partial.	Not active measuring knowledge resources or measuring the effects of KM.	Capturing knowledge from retiring employees.

Initiative 		Denies reusing from repositories; claiming his pride about KM and lecturing about it as not relevant.	Uses the division's IAI-Net site for informal internal publishing; claims using human mobility as a mean of transferring knowledge as not relevant.	Reserved about allocating a role to KM in emergency cases and other operational activities or about including the DKM in staff meetings.
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Table 14-1: Division J - GM behavioural pattern

Though the GM doesn't relate it to KM, innovation is an important issue in division J, and it seems he views KM having long term values, mainly for enhancing the intellectual capital of the division and to benefit from lessons learned; he supports KM, partially because it is required by corporate, and claims he shows it though he doesn't think his pride about it or him lecturing about KM are relevant; the division doesn't consider itself as self-contained and the GM is open to external sources of knowledge; he limits KM to certain employees, limits its connection to operational or business results, and limits the DKM access to staff meetings; yet considers it to be useful to capture knowledge from retiring employees.

14.2 DKM pattern

The author has used the distribution of DKM questions by factors presented in table 6-7 to evaluate and comment upon the answers of the DKM of division J. For example, his average answer to questions relating to management support was 2.3 while the average of all DKMs was 2.62 (↑); and his average answer to questions relating to long term values was 2.9 while the average of all DKMs was 2.66 (↓). The result, showing mainly positions different than the other DKMs average, appears in table 14-2:

Factors	Why	What	How	When
Long term values 	Not to increase innovation; yet believes in KM virtues.			
Management support 	Because the GM recognizes and supports KM efforts.		Directors in the division partially participating in knowledge management efforts.	

Factors	Why	What	How	When
Perception of relevance  	Partially to improve operational processes, the division's competitive advantage and to identify experts in a subject matter; to enable improving productivity.	The monitoring process is partially meant to assess the impact KM performance has on operational or business results.		Considers KM appropriate also for short term, or urgent activities and therefore partially looks for recognition for successful projects.
Quality of performance  	The business situation being partially busy, it affected positively the implementation of KM; believes that using throughput measures helps 'selling' the programme to people who have to implement it.	Active in establishing and leading competence centres and CoPs; encouraging reusing; trusts new knowledge generated mainly from innovation; lecturing about KM only on events dedicated to values and the competitive advantage initiative; the rate and intensity of the monitoring is based on the division's operational results.	Uses the IAI-Net for informal internal publishing; encouraging people to learn from observing failed/successful efforts in the division or in others.	
Profile  	Because KM accomplishments are published; believes the managerial position of people leading it is only partially important; the criteria for measuring his success partially depends on KM performance; partially related to QM.	Maintains the infrastructure needed for KM; takes pride at the division's KM accomplishments.	Feels empowered by the GM; satisfied with the KM organization additional to himself.	Not crucial to be part of the management staff.

Factors	Why	What	How	When
Initiative 		Active in securing sponsorship from management; active in establishing and leading innovation activity; encouraging knowledge acquisition by soliciting knowledge from external sources.	Not encouraging including suppliers or customers in internal meetings; creatively added to the established KM programme; KM efforts seem to be adequately funded.	

Table 14-2: Division J - DKM behavioural pattern

14.3 Division exploratory pattern

Combining the GM and the DKM patterns, and moderating it with information the researcher has from observing the division closely, some of it appearing in the 'table shells', one would get an integrated picture of the behavioural factors relevant to division J and labelled with the positive/negative arrow next to the icon signalling the general impact the factor would have on KM implementation as related to the given factor:

1. Division's main business, situation and self-perception



The J division is a world class leader in its field of aeronautical systems.

1.1 Dependence on other divisions

The division is not dependent on the other divisions of the company (except for the engineering and production divisions from which it purchases necessary capabilities).

1.2 Horizontal versus vertical organization

The division is mainly organised in a vertical (project oriented) organisation, which doesn't encourage knowledge sharing within the division but requires cooperation between the above mentioned divisions.

1.3 Awareness for division-specific or product-specific knowledge

There is awareness for division-specific and product-specific knowledge within the division, these are cultivated, and are used to enhance the division's intellectual property.

1.4 Openness to knowledge from external sources

The GM claims he practices knowledge acquisition by soliciting knowledge from external sources (such as advice/perceptions from customers, suppliers, or consultants, or by reviewing professional literature). The knowledge manager on the other hand, doesn't encourage including suppliers or customers in internal meetings to gather a different perception than the one of the division. They both encourage employees to participate in collaborative acquisition (such as communities of practice outside the company, conventions which have to be documented afterwards). This shows an attitude open to influence and cooperation.

1.5 Openness to using external experts

On the other hand, for the implementation of KM in the division, the GM trust his own forces (as most others do), and objects using external expertise.

1.6 The business situation and its effect on KM performance

The knowledge manager considered the business situation of the division during the evaluation period as partially busy and remarked that it affected positively the implementation of the KM programme.



2. The profile of the division's knowledge manager



2.1 Managerial level

The knowledge manager belongs to the T14000 level.

2.2 Position

The knowledge manager is employed in the systems integration section.

2.3 Seniority

The knowledge manager is quite senior in the division though he holds a quite modest position. He was appointed ever since the beginning of the programme in August 2002.

2.4 Importance attributed to the managerial level

He believes managerial position, is an attribute for the implementation of KM (maybe because he doesn't hold any).

2.5 Importance attributed to seniority

He believes seniority is an attributes for the implementation of KM (he also doesn't believe it can be bought from outside the company).

2.6 Importance attributed to publicity

The publicity of his performance is important to him,

2.7 Exclusivity in dealing with KM

The GM believes KM has to be led by people fully dedicated to it and not as a part time job.

2.8 Relationship to other tasks

The knowledge manager considers KM to be mutually related to IT, and change.

2.9 Pride for KM

The knowledge manager takes pride at the division's KM accomplishments and is ready to lecture about it to others (he is actually prouder than most knowledge managers of the KM accomplishment of his division).

2.10 Ambition to promote the division to a leading position in process knowledge

Both he and the GM view promoting the division to a leading position in the process knowledge within the company one of their goals.



3. Attitude to long term values



3.1 KM as an enabler of long term values

The knowledge manager doesn't consider KM as an enabler to increase innovation, yet he, as well as the GM, trusts the virtues of KM.

3.2 KM as an enabler of short term values

The GM believes KM can enhance the division's ability to develop and deliver knowledge-based goods or services, and the division's intellectual capital. Both the GM and the knowledge manager rely on KM more for short term

advantages as to improve the division's new product introduction (NPI) process, or to improve its ability of standing up to the CMMI standards.

3.3 Culture as a management task

They both consider it their task to establish an enterprise of knowledge culture, of sharing, and of continuous learning in the division.



4. The relationship with management



4.1 Dependence on the GM

The knowledge manager states he is dependent and influenced by the GM.

4.2 GM's dependence on corporate

The GM on the other hand claims he is not dependent on corporate for the performance of the KM programme which he supports. Yet, he highly values scoring activities evaluated by corporate.

4.3 Pride for KM

The GM was new at the period of filling the questionnaire and preferred not to answer this question.

4.4 GM's recognition that KM is part of his success criteria

According to the GM, the criteria for measuring success are based on his organization's mission, objectives, and goals, and KM is only a small part of them.

4.5 Knowledge manager's empowerment by the GM

Both agree that the GM is empowering the knowledge manager he has appointed with the responsibility and authorization, authority and resources to enforce the KM programme in the division.

4.6 GM's explicit support

Both agree that the GM shows his support to the KM programme explicitly. The GM even states he takes active part in KM events, not only as an invited manager (not corroborated by the knowledge manager).

4.7 GM's recognition of doers

Both agree that the GM is openly recognising doers.



5. The perception of relevance KM has with the division's performance ↑

5.1 KM as an enabler for improved capability

The knowledge manager as well as the GM considers KM as an enabler to implement new or better ways of working, to improve learning/ adaptation capability, and to improve employee skills.

5.2 KM as an enabler for improved performance

The GM believes KM can enhance product or service quality, improve productivity and save costs. The GM also believes he can minimize faults by reusing lessons learned.

5.3 Using incentives to promote KM

The knowledge manager doesn't seem enthusiastic about the issue of establishing incentives (not necessarily material, such as aligning rewards and performance evaluation with KM, spotlighting top players) to motivate employees to perform KM in the division.

5.4 The validity of return on investment on KM

The GM is looking for return on investment of KM efforts in terms of results measures, and the knowledge manager indeed chose a result measure in 2003 (though it was not actually measured at the time, so that its achievement was not known).

5.5 The applicability of KM below the management level

Both the knowledge manager and the GM understand KM is not only applicable to management but there is no evidence it has indeed penetrated below it. The GM thinks KM is not applicable to all levels of employees and suggests dealing more intensively with employees prior to their retirement.

5.6 Knowledge managers as participants in short term activities

The GM does not consider KM to be relevant to short term issues and rely on it for long term benefits. The knowledge manager on the other hand, would require involving him or the knowledge leaders in the preparation of an important bid, in the IPT of an important project at the evaluation stage or in any other significant event – an indication to the fact that he attributes to KM also short term advantages.

5.7 Using throughput measures to 'sell' KM to personnel

The knowledge manager doesn't believe it can help him.

5.8 Using business result measures to 'sell' KM to management

The knowledge manager doesn't believe this too, can help him.

6. The level of initiative on the part of the knowledge manager ↑



6.1 Time allocated to KM

The knowledge manager allocates 20% of his time to KM on a regular basis.

6.2 Consideration of KM as a recommendation only

Like most knowledge managers, he doesn't consider KM as a recommendation only, and takes it seriously.

6.3 Securing sponsorship

He is active in securing sponsorship (such as obtaining management buy-in, making sure management understands and is ready to promote KM).

6.4 Creative contributions to the programme

He has been active in establishing and leading innovation activity, or encouraging employees to participate in it (he participated in the Disrupt-It project for the European community, in which an 'idea pipeline' was designed).



7. The programme performance ↓

7.1 Belief KM has been performed without calling it as such

Like most others, the knowledge manager believes his division has been performing KM without calling it as such.

7.2 Organising for KM

The knowledge manager maintains the establishment of the infrastructure needed for KM (such as managing the knowledge leaders, having a plan for the implementation of the programme and its monitoring process).

7.3 Activity in performing KM

The knowledge manager believes new knowledge is generated mainly from the innovation activity. He has been active in establishing and leading multi-

divisional communities of practice, or encouraging employees to participate in them.

The GM preaches documenting in an organised way, enabling it to be reused and shared, as part of everyday work processes. He also values process knowledge and claims to be active in improving processes through process analysis, enhancing the division's intellectual property, and advocating sharing good practices.

They are both claim to be active in identifying critical knowledge, leading the activity needed to capture it, in establishing and leading competence centres, or encouraging employees to participate in them.

7.4 Communicating KM

The GM is communicating the programme and lecturing about it on events dedicated to values and the competitive advantage initiative. The division's IAI-Net site is mainly used for informal internal publishing (such as posting an idea to encourage involvement in general or innovation specifically).

7.5 Monitoring KM

There is a monitoring process established in the division for the KM programme claimed to be partially adaptive to the division's operational results or at least to the KM performance and it is lead by the knowledge manager but without the involvement of the GM.

14.4 Interviews as a reinforcement to the exploratory phase

The interview was conducted with J's GM and DKM seven months after they have filled the questionnaires (for details about the structure of the interview see section 5.6.1). Referring to the three subjects handed over for discussion to the respondents ahead of the interview, this is a list of indicative quotes they made:

Linking KM to business

GM: "People in J don't know how to relate their performance with knowledge management. They must be doing something right about reuse since the development costs that I'm getting today are lower by a factor of four than what we used to get, mainly in one of the more advanced fields".

DKM: "We have been trying to create generic software modules to facilitate reuse, but got ridiculous quotes for them. Nevertheless, some of them were developed anyway, and the cost was reduced".

GM: "This can be done in avionics due to the similarity of projects. In engineering, every project is different, and similarity is only in the ILS portion of the project. After sales is concentrating knowledge from all projects and can benefit from this collection of experience".

DKM: "Things are done methodically only when we are forced to it by customers or by standard procedures as for example in software development by the international industrial standard as DO178".

GM: "The most difficult problem is to capture knowledge from specific experts who are not willing to share their knowledge with others; on the other hand, the usage of common and shared directories is a success story."

Monitoring the programme

GM: "The implementation process reminds of how things started with the CAI programme. We learned there that it is important to maintain a methodical pace even if at the beginning the participants did not really understand what is expected from them".

DKM: "The deputy GM is following up the programme on a monthly basis. Directors are not involved¹ in the reviews, and reports are made by the knowledge manager and the knowledge leaders".

GM: "It was like that at the beginning of the CAI programme; CAI leaders were reporting at reviews while the directors present did not know what was going on. Now, it is the other way all together, and the directors are leading the reviews". "We should reach the stage of making KM an action of the division PDM".

Authority/Responsibility of the knowledge manager

DKM: "I don't belong to the T300 level and do not participate in staff meetings except two to three times a year for 10-15 minutes²."

GM: "In my opinion, the knowledge manager should participate in the various forums at the T1000 level where subjects affecting the whole division are presented".

To summarize, KM in J is the personal effort of the DKM; it is not enforced by the GM and since it is only partially controlled, duplicating it is questionable. The monitoring of the programme without the directors doesn't prepare them for an eventual take over of the activity from the knowledge leaders. The knowledge manager being low ranked is totally dependent on the deputy GM, on the GM, or on the change champion.

14.5 Pattern of behavioural factors

Gathering arrow labels for the behavioural factors relevant to division J one would get the following integrated picture:

Factor	Pattern
Long term values	↓
Management support	↓
Perception of relevance	↑
Division self-perception	↓
Quality of performance	↓
Profile	↓
Initiative	↑

Table 14-3: Pattern of behavioural factors for division J

14.6 PDM pattern

1. KM procedures (2003)

Division J stated in 2003 it was going to deal with all 5 KM procedures: ↑

¹ As opposed to questionnaire information appearing in section 14.2 of this appendix.

² From the questionnaire information appearing in section 14.2 of this appendix one could deduce that it is not important to belong to the management staff, yet during the interview, the DKM seems to complain about it.

Enhancing the awareness for the programme.
 Managing the knowledge from lessons learned.
 Fostering the knowledge of core competence centres.
 Knowledge extracted from the innovation process.
 Communities of practice.

2. KM measures (2003)

To each of these procedures it matched a measure (one of them throughput and one business result measure) with a goal: ↑

Training employees for communities of practice (performance measure): 1.
 Training management for managing the knowledge from lessons learned (performance measure): 1.
 Implementation of lessons learned (performance measure): 4.
 Personal data update in 'yellow pages' (performance measure): 100 employees.
 Shortening the time to approve an innovation proposal (throughput measure): to 1 month.
 Deciding on operational issues in the community of practice (business result measure): 1 issue.

3. KM Actions and directorate participation to enable goal achievements (2003)

Conducting the training sessions.
 Establishing a database of lessons learned.
 Organising a team to review lessons learned. ↑
 Building a 'transparency' home-page in the division's portal.
 Establishing a database of innovation proposals.
 Operating the community of practice for human engineering.
 Actions were not attributed to any of the directorates. ↓

4. Achievements of goals (2003)

The KM programme was not quite monitored in 2003 so for most of the goals there is no reliable information on their achievements. The only exceptions are:

Training for communities of practice was not performed. ↓
 Employees were trained to load lessons learned in the appropriate database. ↑
 Personal data from 280 employees was loaded to the 'yellow pages'. ↑
 The 'human engineering' community of practice had not been established. ↓

5. KM procedures (2004)

In 2004, the Policy Deployment Model (PDM) has been updated in such way that only one procedure by KM phase could be chosen. J chose the following procedures: ↑

Enhancing the awareness for the programme.
 Managing the knowledge from lessons learned (from the capturing and documenting knowledge phase).
 Fostering the knowledge of core competence centres (from the retrieving knowledge for reuse phase).

Knowledge extracted from the innovation process (from the creating new knowledge phase).

Establishing communities of practice (from the sharing knowledge phase).

6. KM measures (2004)

To each of these procedures it matched a measure with a goal:

Programme presentation to division's management (performance measure): 4 times.

Number of debriefings performed (performance measure): 4.

Documenting knowledge from the competence centres (throughput measure): 1 instance.

Implementation of innovation proposal (throughput measure): 1 case.

New knowledge created by the community of practice (performance measure): 1 case.

Knowledge managers are required to choose 1 throughput measure and possibly one business results measure. The choice made in the J case is therefore as required. ↑

7. KM Actions and directorate participation to enable goal achievements (2004) ↑

Meetings with the division's management.

Establishment of a KM forum in the division.

Implementing a process for dealing with the treatment of malfunctions reported. ↑

Establishment of the 'avionics' homepage at the division's site.

Presentation of the chosen innovation case.

Establishment of the 'human engineering' community of practice.

In 2004, the knowledge manager distributed tasks among some of the knowledge leaders. ↑

8. Achievements of goals (2004)

The PDM system in 2004 enabled the knowledge managers to actually update their achievements along the year, according to their goals (which were also distributed on a monthly or quarterly basis):

Programme presentation to division's management: 1 time. ↓

Number of debriefings performed: 10. ↑

Documenting knowledge from the competence centres: 1 instance. ↑

Implementation of innovation proposal: 1 case. ↑

The 'human engineering' community of practice had not been established. ↓

14.7 Mutual assessment pattern

1 Self and Mutual assessment grade (2003)

The J division graded itself at 1.08 (regarding all phases). The mutual assessment grade was 0.49 divided as follows:

1.1 Managing and tracking of the programme (2003)

Only three knowledge leaders were nominated but they were not assigned any tasks yet. The GM reviewed the programme twice during the year (lower than company's average): 0.35. ↓

1.2 Capturing and documenting knowledge (2003)

13 lessons learned were documented. A common directory for shared presentations and proposals was created (higher than company's average): 1.2. ↑

1.3 Retrieving knowledge for reuse (2003)

The list of competence centres to be fostered is not up-to-date. Retrieving knowledge from previous projects is partially implemented (higher than company's average): 0.85. ↑

1.4 Creating knowledge (2003)

A comprehensive innovation process is generating new knowledge (higher than company's average): 0.85. ↑

1.5 Sharing knowledge (2003)

Some of the processes have been analysed to be proposed as good practices but nothing was achieved yet. The division's 'transparency' portal is considered a good example (lower than company's average): 0.35. ↓

2. Objectivity – mutual over self assessment (2003)

The author is considering an objectivity factor of between 0.8 and 1.2 as sign of reality for the division assessing its own performance. This is definitely an advantage to whoever is interested in corrective action, as it positions the division in a closer position to where it should be. The objectivity factor, calculated to be 0.45, shows J to be over-confident. ↓

3. Self and Mutual assessment grade (2004)

Division J graded itself higher than in 2003 at 1.9. The mutual assessment grade was 0.87 divided as follows: ↑

3.1 Managing and tracking of the programme (2004)

Knowledge leaders were nominated in most directorates. The programme was presented to the division's management only once: 0.67 (lower than company's average). ↓

3.2 Capturing and documenting knowledge (2004)

A partial list of subjects to be captured was established. Lessons learned are screened at the kick-off of new projects: 0.5 (lower than company's average). ↓

3.3 Retrieving knowledge for reuse (2004)

The list of competence centres was updated. A database for proposals was established: 0.67 (lower than company's average). ↓

3.4 Creating knowledge (2004)

Change proposals belonging to one project are documented but do not serve as a basis for consideration in new cases belonging to other projects: 0.5 (lower than company's average). ↓

3.5 Sharing knowledge (2004)

Participation in communities of practice is growing. The division's site has been designed using its potential visitors' requirements. Nevertheless, the generation

of good practices isn't done in a methodical way – 0.67 (lower than company's average). ↓

4. Objectivity – mutual over self assessment (2004)

The objectivity factor, calculated to be 0.46, shows J hasn't improved their self assessing capability as compared to last year (was 0.45). ↓

14.8 Pattern of performance

	Success Parameter		J		Improvement		Pattern
			2003	2004	Av.	Lead/lag	
PDM	Number of KM procedures		5	5			
	Number of measures		5	5			
		Performance	5	3			↑
		Throughput	-	2			↑
		Business result	-	-			
	Achievement of goals		50%	80%			↑
	Number of actions		5	6			↑
	Follow up on actions		-	17%			↑
	KM programme participation		-	6			↑
M/A	Mutual assessment grade		0.49	0.87	2.11	84%	↓
		Managing and tracking of the programme	0.35	0.67	1.73	111%	↑
		Capturing knowledge	1.18	0.5	1.41	30%	↓
		Retrieving knowledge for reuse	0.85	0.67	1.02	77%	↓
		Creating knowledge	0.85	0.5	1.47	40%	↓
		Sharing knowledge	0.35	0.67	1.36	141%	↑

Table 14-4: Division J - Pattern of performance

From the pattern of performance of the J division, one can see improvement of performance with regard to the PDM measures in as much as there are already two throughput measures in 2004. The number of actions also increased, yet only 17% of them were managed, and the number of goals achieved increased. This could be a sign of the persistence of the DKM.

The M/A section of the pattern of performance of the J division shows an absolute decrease in performance of three of the four phases in the life cycle of KM (while the whole company marked improvements in most of them).

14.9 Division analysis

The J division is a world class leader in its field of aeronautical systems. The division is basically project oriented. Its engineering capability is either supplied across projects by the division's engineering directorate or by another division specializing in engineering (division N). The same goes for its production

capability which could be part of the project, taken from a division's directorate servicing all projects or from another division. The nature of the division's business is involved with the integration of other division's systems in J's projects. All this creates a basis for extensive cooperation, both inside and outside the division.

Comparing the achievement of goals between 2003 and 2004 shows some improvement, probably restrained by the lack of communication about KM needed to be performed by the knowledge manager in the division. The mutual assessment grade improved (by 178%), lower than the company's average (211%), though there was a degradation in the components of knowledge capture, retrieval of knowledge and of the creation of new knowledge. The author will try now to explore the behavioural factors in J, hoping they will constitute at least a background if not a rationale to these results.

The division has realized that its biggest competitive advantage comes from the innovative aspect of its solutions and has therefore established an operation dedicated to innovation. The division is quite aware of being special in its integration methods. Those being at the core of their business, they are cultivated, are kept closely and are used to enhance the division's intellectual property (**self perception**).



J's knowledge manager doesn't hold in the division any managerial position besides KM. Being one of the integration engineers, actually makes him dependent on other functions in the division or in the company, their product he is to integrate. Therefore, he is eager to succeed in any application of KM, to give it the right publicity and to ride on it to recognition (**profile**).



He was very active in trying to establish a multi-divisional community of practice led by the division and he finally succeeded (though it took over a year to accomplish it). He is trying very hard to involve the J division in the content management programme (part of the KM programme) and initiated a Kaizen event to pre-organise the existing information (**initiative**¹).



According to the GM, the criteria for measuring success are based on his organization's mission, objectives, and goals, and KM is only a small part of them. Yet, the GM would highly value the score given by corporate to his KM activity – the 2004 mutual assessment grade of 0.87 was very much considered by him as lowering the division's average in other fields (though it was an improvement of 178% from the 2003 grade). The knowledge manager is very much dependent on the GM to give him the authority he naturally lacks, for the implementation of KM. Even though they both agree the GM is supportive of the programme, it seems that a more openly involvement of the GM could help the knowledge manager achieve more (**management support**).

¹ The definition of initiative being 'finding ways and resources to make it happen', one can see the case of the J DKM exemplary in as much as he went beyond the specifications in the KM handbook and organized a Kaizen event to expedite the implementation of a specific KM procedure.

Both the GM and the knowledge manager, claim the right statements when asked about their task in implementing a culture of sharing or of continuous learning in the division. They also probably see a vague connection between KM and these **long term values**. But when it comes to looking for giving the division a real time competitive advantage, they consider KM as an enabler to implement new or better ways of working, to improve learning/ adaptation capability, and to improve employee skills. The GM shows a more pragmatic approach by suggesting concentrating on capturing knowledge from personnel ahead of their retirement. The knowledge manager has tried to keep the KM programme relevant to the division's activity by picking throughput measures in 2004. Nevertheless he doesn't consider using those as a selling pitch to performers or to management (**relevance**).



J's knowledge manager is willing to perform the KM programme by the book. He trusts the values attributed to KM, but mainly wants to perform as expected and to show the GM that the division can be highly graded by corporate. He has also taken the pragmatic approach of choosing procedures more readily implemented in the division as the 'transparency' IAI-Net site in 2003 or the creation of innovative knowledge in both years, 2003 and 2004 (**quality of performance**). The knowledge manager would be willing to lecture more about the programme within the division, but he feels he is not backed enough to do this. The monitoring of the KM programme (only at the division level and not involving the directorates) was admitted not to be led by the GM but also not to be related to the division's performance.



J's knowledge manager didn't improve the assessment of his KM performance in 2004 as compared to the one in 2003, and stayed at the over-confident level of 0.45. The reality of the assessment is a first step in the way to improve the implementation of the programme.

Appendix 15: Division N analysis

15.1 GM pattern

The author has used the distribution of GM questions by factors presented in table 6-6 to evaluate and comment upon the answers of the GM of division N. For example, his average answer to questions relating to management support was 2.05 while the average of all GMs was 2.34 (↑). The result, showing mainly positions different than the other GMs average, appears in table 15-1:

Factors	Why	What	How	When
Long term values  ↑	To improve staff attraction and retention; to increase innovation; and to enhance the division's intellectual capital.	Encouraging employees to practice knowledge acquisition by participating in collaborative acquisition.	Doesn't believe in learning from observing failed/successful efforts in the division or in others; believes KM can improve collaboration within the organization.	
Management support  ↑	Definitely not because top corporate management recognizes and supports knowledge management efforts; the criteria for measuring success are based on the organization's mission, objectives, and goals and KM is part of them.		Supports and showing it; active increasing employees' empowerment.	
Perception of relevance  ↑	Because it gives him better customer handling; enables better decision making; improves employee skills; looking less than the others for return on investment of KM efforts in terms of results measures; business was positive and it helped.	Active in identifying critical knowledge, leading the activity needed to capture it.	Thinks they perform KM without calling it as such.	Believes they can minimize faults by reusing lessons learned.

Factors	Why	What	How	When
Division self-perception 		Open to external sources of knowledge.	Reserved about external experts for KM implementation.	
Quality of performance 	Exclusivity of the DKM not necessarily required; believes it is applicable to all levels of employees.	Claims there is a monitoring process established in the directorates.	Empowering the DKM.	Capturing knowledge from retiring employees.
Initiative 		Takes pride at the division's KM accomplishments and lectures about it.	Including suppliers or customers in internal meetings to gather a different perception than the division's; doesn't use e-mail for formal internal publishing.	Denies a role to KM in emergency cases and other operational activities; would not include the knowledge manager or leaders at staff meetings.

Table 15-1: Division N - GM behavioural pattern

The GM of division N believes in the long term value of knowledge, but not necessarily of knowledge management. KM is not the solution to today's problems; rather, it would prepare us for those of next year. He supports the programme, but not because corporate requires it. Therefore, he less than the others, expects a return on the investment for KM. He backs up the DKM and empowers him as well as other managers in the division. The feeling in the division is that there isn't anything they can learn from other divisions, yet they are ready to transfer their knowledge to others.

15.2 DKM pattern

The author has used the distribution of DKM questions by factors presented in table 6-7 to evaluate and comment upon the answers of the DKM of division N. For example, his average answer to questions relating to quality of performance was 2.47 while the average of all DKMs was 2.64 (↑); and his average answer to questions relating to initiative was 2.55 while the average of all DKMs was 2.43 (↓). The result, showing mainly positions different than the other DKMs average, appears in table 15-2:

Factors	Why	What	How	When
Long term values 	To enhance the ability to develop and deliver knowledge-based goods or services.			

Factors	Why	What	How	When
Management support  ↓	The GM recognizes and supports KM efforts, but he is not looking for ROI.			Asks the GM to take active part in KM events not only as an invited manager.
Perception of relevance  ↑	To improve operational processes and the division's competitive advantage; to enhance product or service quality.			
Quality of performance  ↑	Believes that using throughput measures partially helps in 'selling' the programme to people who have to implement it.	There is a monitoring process established in the division for the KM programme and management is involved in it.	Thinks the division performs KM without calling it as such.	
Profile  ↑	Attributes strong connection between KM and the change process, and some with HR; denies exclusivity when dealing with KM.	Feels in position to direct KM performance by people his is not managing; partially takes pride at the division's KM accomplishments.	Believes the position of KM manager can be filled with a young person new to the company.	
Initiative  ↓		Active in establishing and leading innovation activity.	Has creatively added to the established KM programme additional content; active in enhancing the division's intellectual property; only partially active measuring knowledge resources.	Allocates time to KM not on a regular basis and rather responding to requests.

Table 15-2: Division N - DKM behavioural pattern

The DKM is also the champion of the change process and also deals with quality management, so the notion of long term values is not strange to him. So it is for the GM and the DKM knows it and therefore sweeps aside the issue of ROI. Nevertheless, the DKM also finds practical reasoning to the implementation of KM. He also doesn't only hope for management support, but actively seeks it. On the other hand, he still expressed the thought that they have always performed KM, though not methodically. The DKM is listened to in the N division and this definitely helps him in the implementation and in initiating new application for it. Notwithstanding his position, he regards the task as

professional, such that can be filled by people regardless of their experience and status.

15.3 Division exploratory pattern

Combining the GM and the DKM patterns, and moderating it with information the researcher has from observing the division closely, some of it appearing in the 'table shells', one would get an integrated picture of the behavioural factors relevant to division N and labelled with the positive/negative arrow next to the icon signalling the general impact the factor would have on KM implementation as related to the given factor:

1 Division's main business, situation and self-perception



The N division offers a single site, cost-competitive, aerospace engineering centre. The N division encompasses every required engineering discipline and expertise for the integrative development of a complete aircraft - from concept definition to prototype testing and certification.

1.1 Dependence on other divisions

As a supplier of engineering effort to them, the division is dependent on other divisions of the aircraft groups but is generally very different than the other divisions of the company.

1.2 Horizontal versus vertical organization

The division's organisation is totally technology proficiency oriented and this could help the knowledge sharing potential and the value of the intellectual property.

1.3 Awareness for division-specific or product-specific knowledge

There is awareness for division-specific and product-specific knowledge within the division, these are cultivated, and they are used to enhance the division's intellectual property. On the other hand, it situates the division in an elite position, exporting its knowledge to others but not importing any.

1.4 Openness to knowledge from external sources

The knowledge manager stated he doesn't practice knowledge soliciting from external sources and certainly not from other divisions.

1.5 Openness to using external experts

As most others do, the GM as well as the knowledge manager also objects using external expertise for the implementation of KM in the division.

1.6 The business situation and its effect on KM performance

The GM considered the business during the evaluation period to be satisfactory, and considered it to have a positive effect on the implementation of the KM programme.

2 The profile of the division's knowledge manager



2.1 Managerial level

The knowledge manager belongs to the T300 level.

2.2 Position

The knowledge manager is the change champion besides being responsible for software quality assurance in the division.

2.3 Seniority

He is very senior in the division and was appointed ever since the beginning of the programme in August 2002.

2.4 Importance attributed to the managerial level

He believes a managerial position is an attributes for the implementation of KM.

2.5 Importance attributed to seniority

He does not necessarily believe the seniority of the knowledge manager is an attribute for KM implementation.

2.6 Importance attributed to publicity

The publicity of his performance is important to him, yet he doesn't consider KM to affect his success measure.

2.7 Exclusivity in dealing with KM

The knowledge manager doesn't believe KM has to be led by people dedicated only to KM.

2.8 Relationship to other tasks

He considers KM to be mutually related to QM and to the change process.

2.9 Pride for KM

The knowledge manager was more reserved when answering the question about taking pride at the division's KM accomplishments (such as lecture about it outside the division).

2.10 Ambition to promote the division to a leading position in process knowledge

They are both active in improving processes through process analysis and trust that it would promote the division to a leading position in the process knowledge within the company (considered as one of their goals).



3 Attitude to long term values



3.1 KM as an enabler of long term values

The knowledge manager (as opposed to the GM), doesn't consider KM as an enabler to increase innovation.

3.2 KM as an enabler of short term values

Yet, he believes it can enhance the division's NPI ability, and its intellectual capital.

3.3 Culture as a management task

The knowledge manager as well as the GM, considers it his task to establish an enterprise of knowledge culture, a culture of continuous learning and an environment of sharing in the division.



4 The relationship with management



4.1 Dependence on the GM

The knowledge manager considers himself as being in a position to direct KM (though he stated his dependency on the GM). Nevertheless, he has been performing the programme without the involvement of the other division's directors (maybe because he didn't feel that this would be supported by the GM).

4.2 GM's dependence on corporate

The GM denies he supports KM because of corporate interest but rather due to his own reasoning.

4.3 Pride for KM

The GM takes pride at the division's KM accomplishments (such as lecture about it outside the division).

4.4 GM's recognition that KM is part of his success criteria

He considers KM as being part of the criteria for measuring his success.

4.5 Knowledge manager's empowerment by the GM

The knowledge manager feels empowered by the GM with the responsibility and authorization, authority and resources to enforce the KM programme in the division.

4.6 GM's explicit support

The knowledge manager states he is supported openly by the GM.

4.7 GM's recognition of doers

The GM is not known as usually recognising doers.



5 The perception of relevance KM has with the division's performance ↑

5.1 KM as an enabler for improved capability

Both the knowledge manager as well as the GM trusts that KM can help to implement new or better ways of working, to improve operational processes and the division's competitive advantage, and to give the division improved productivity. He also believes new knowledge is generated mainly from the project activity.

5.2 KM as an enabler for improved performance

Both he and the GM believe that KM would enhance the division's ability to develop and deliver knowledge-based goods or services and improve their quality. They also consider KM to be relevant to operational issues as minimizing faults through lessons learned as well as to business issues as maximizing profit.

5.3 Using incentives to promote KM

Both believe incentives aligning recognition to results can help motivate KM performance.

5.4 The validity of return on investment on KM

Neither the knowledge manager nor the GM is looking for return on investment of KM efforts in terms of results measures.

5.5 The applicability of KM below the management level

The knowledge manager understands KM is not only applicable to management but it has penetrated below it in a very limited way.

5.6 Knowledge managers as participants in short term activities

They consider the knowledge manager not to be relevant to short term issues.

5.7 Using throughput measures to 'sell' KM to personnel

The knowledge manager believes using throughput measures would only partially help him in 'selling' the programme to people who have to implement it.

5.8 Using business result measures to 'sell' KM to management

The knowledge manager also doesn't believe using business results measures would help him 'selling' the programme to management.



6 The level of initiative on the part of the knowledge manager ↑

6.1 Time allocated to KM

The knowledge manager allocates 20% of his time to KM but not on a regular basis.

6.2 Consideration of KM as a recommendation only

He doesn't consider KM as a recommendation only.

6.3 Securing sponsorship

He is active in securing sponsorship (such as obtaining management buy-in, making sure management understands and is ready to promote KM).

6.4 Creative contributions to the programme

The knowledge manager took the initiative of introducing a new process for the monitoring and measurement of the knowledge created during the project performance. The process was designed as a software application and latter used in one of the divisions as a pilot, prior to its standardisation across the company. The design and development of this application has been a quite considerable effort.



7 The programme performance

7.1 Belief KM has been performed without calling it as such

Both the knowledge manager as well as the GM believes they have been performing KM without calling it such.

7.2 Organising for KM

The knowledge manager maintains the establishment of the infrastructure needed for KM (such as managing the knowledge leaders, having a plan for the implementation and its monitoring process), yet he is not satisfied with the way it functions.

7.3 Activity in performing KM

The knowledge manager is active in establishing and leading innovation activity, or encouraging employees to participate in it (questionnaire information).

7.4 Communicating KM

Both are communicating KM at all levels of personnel and lecture about it, not only on scheduled events.

7.5 Monitoring KM

There is a monitoring process established in the division for the KM programme and it is lead by the knowledge manager without the involvement of the GM, yet its rate and intensity are not based on its results.

15.4 Interviews as a reinforcement to the exploratory phase

The interview was conducted with N's GM and DKM five months after they have filled the questionnaires (for details about the structure of the interview see section 5.6.1). Referring to the three subjects handed over for discussion to the respondents ahead of the interview, this is a list of indicative quotes they made:

Linking KM to business

GM: "I am opposed to the method of planning procedures in order to achieve better performance and eventually better results. I deal with soft values and I don't believe we should or can measure everything".

"I believe communication 'is key' to success and it is my task to transmit these soft values to each and all employees in the division".

DKM: "I think the GM relates to technological knowledge, while we, in the KM programme deal with process knowledge. Process knowledge is more measurable than technological knowledge. Nevertheless, cycle time in engineering is longer than the average in the company, so it is indeed more difficult to deduce preferred methodologies as a result of measures".

GM: "I agree with the differentiation but I still think that in order to improve results, we need to reach the processes through people and interconnect between them. What matters is not 'knowing what' but rather 'knowing who'. The solution to tacit knowledge is therefore through apprenticeship. There you have a '*meister*' from whom you learn by doing. That's how I did it when I was young and that's the way to do it".

DKM: "Apprenticeship is realisable when the intake of young engineers is manageable by the '*meister*'. Nowadays, because of the volume of work, we have to recruit big numbers of young employees and then, a preferable method, in my opinion, is to create engineering handbooks, to incorporate in them the '*meister*'s know-how and by this to create the needed explicit knowledge."

Monitoring the programme

GM: "I trust the knowledge manager for the performance of the programme and for its monitoring. My way to monitor the performance of the division is by being involved in the design. For example, I gather every few weeks a peer review on various programmes, and we dive in there to the detailed level. I also use the occasion to bring into those meetings young engineers who may not be involved with the programme, but even then, they learn from them".

The knowledge manager has been choosing throughput and business result measures during the two years of the evaluation period, and this is probably the best way to monitor the programme while keeping it well related to the division's goals.

Authority/Responsibility of the knowledge manager

DKM: "My belonging to the management staff of the division helps and I don't have any problem guiding employees through the KM procedures requirements, though I'm not their direct manager. It is evident that we perform better today than we were in the past and I try to leverage this in advocating for KM".

GM: "The very way we are organised in a matrix manner is the vehicle to distribute knowledge".

To summarise, it seems the GM worships and talks about knowledge but doubts its measurement and management, while the knowledge manager strives for its management implementation.

15.5 Pattern of behavioural factors

Factor	Pattern
Long term values	↑
Management support	↓
Perception of relevance	↑
Division self-perception	↑
Quality of performance	↑
Profile	↑
Initiative	↑

Table 15-3: Pattern of behavioural factors for division N

15.6 PDM pattern

1. KM procedures (2003)

The N DKM stated in 2003 he was going to deal with all 5 KM procedures: ↑

Enhancing the awareness for the programme.

Capturing knowledge.

Fostering the knowledge of core competence centres.

Knowledge extracted from the innovation process.

Using the division IAI-Net portal to share knowledge.

2. KM measures (2003)

To each of these procedures it matched a measure (one of them throughput and one business result measure) with a goal: ↑

KM programme presentation to employees (performance measure): 6

Knowledge based engineering (KBE) applications (performance measure): 2

Engineering handbooks (throughput measure): 8

Quality of design (business result measure): 15%

Portals for knowledge sharing (performance measure): 4

3. KM Actions and directorate participation to enable goal achievements (2003)

Programme presentation to T1000 staff.

Development of design methodologies.

Documentation of engineering handbooks. ↑

Developing KBE applications.

R&D for new knowledge creation.

Competence centres home pages in the division portal.

Actions were attributed to all directorates (though there were no knowledge leaders to lead them). ↓

4. Achievements of goals (2003)

The KM programme was not quite monitored in 2003 so for most of the goals there is no reliable information on their achievements. The only exceptions are:

The KM programme was partially presented at one of the gathering of employees. ↓

Very partial KBE implementation. ↓

Engineering handbooks widely implemented.

The division's portal is more applicative (less declarative) than most others.



5. KM procedures (2004)

In 2004, the Policy Deployment Model (PDM) has been updated in such way that only one procedure by KM phase could be chosen. N chose the following procedures:

Enhancing the awareness for the programme.

Capturing knowledge (from the capturing and documenting knowledge phase).

Establishing a business and technological knowledge base (from the retrieving knowledge for reuse phase).

Knowledge extracted from the innovation process (from the creating new knowledge phase).

Generating good practices (from the sharing knowledge phase).



6. KM measures (2004)

To each of these procedures it matched a measure with a goal:

Procedures identified as contributors to the division's results (business result measure): 3 procedures

Number of areas for knowledge to be captured (performance measure): 4

Division's technological information is gathered databases (performance measure): 3

Number of generic innovative ideas (performance measure): 50

Number of approved good practices (performance measure): 6

The fact that the knowledge manager chose one throughput measure and one business results measures is quite positive because it readily connects the KM programme to the operational or business goals of the division.



7. KM Actions and directorate participation to enable goal achievements (2004)

Institution of a knowledge forum in the division.

Development of engineering handbooks and specifications.

Producing procedural handbooks in the various directorates.

Identification and documentation practices to be presented for approval.

Mapping of the competence centres.

Debriefing performance.

Technological knowledge enrichment.

In 2004, the knowledge manager distributed tasks among the knowledge leaders.



8. Achievements of goals (2004)

The PDM system in 2004 enabled the knowledge managers to actually update their achievements along the year, according to their goals (which were also distributed on a monthly or quarterly basis):

Actions in the division's PDM implemented using KM procedures: 4 actions.

Number of areas for knowledge to be captured: 4

Division's technological information is gathered databases: 3

Number of generic innovative ideas: 24

Number of approved good practices: 5



15.7 Mutual assessment pattern

1. Self and Mutual assessment grade (2003)

Division N graded itself at 1.15 (regarding all phases). The mutual assessment grade was 0.66 divided as follows:

1.1 Managing and tracking of the programme (2003)

No organisation was established for the KM programme except for the appointment of the knowledge manager. The GM reviews the change process achievements on a quarterly basis, and among them is the KM process (higher than company's average): 0.85



1.2 Capturing and documenting knowledge (2003)

The subjects of knowledge to be captured and documented constitute the intended content of the engineering and of the procedural handbooks (lower than company's average): 0.55



1.3 Retrieving knowledge for reuse (2003)

The list of competence centres to be fostered is not up-to-date. Retrieving knowledge from the engineering handbooks is implemented by most (higher than company's average): 0.86



1.4 Creating knowledge (2003)

Documenting new knowledge from projects is partially done (lower than company's average): 0.6



1.5 Sharing knowledge (2003)

Some of the practices are published as good practices. The division's portal is considered one of the few enabling actual operation of applications, necessary in every-day work (higher than company's average): 0.95



2 Objectivity – mutual over self assessment (2003)

The author is considering an objectivity factor of between 0.8 and 1.2 as sign of reality for the division assessing its own performance. This is definitely an advantage to whoever is interested in corrective action, as it positions the division in a closer position to where it should be. The objectivity factor, calculated to be 0.57, shows N to be a little over-confident.



3 Self and Mutual assessment grade (2004)

N graded itself higher than in 2003 at 1.9. The mutual assessment grade was 0.93 divided as follows:



3.1 Managing and tracking of the programme (2004)

In most directorates, the directors themselves were nominated by the deputy GM as knowledge leaders: 1 (higher than company's average).



3.2 Capturing and documenting knowledge (2004)

Each directorate specified a list of subjects to capture knowledge about and prioritised it. – 1 (higher than company's average).



3.3 Retrieving knowledge for reuse (2004)

The list of competence centres was updated. A database for proposals was established in most directorates: 1 (higher than company's average). ↑

3.4 Creating knowledge (2004)

A new software tool for the management of project knowledge has been designed and developed as an initiative of the knowledge manager: 1 (higher than company's average). ↑

3.5 Sharing knowledge (2004)

Participation in communities of practice is growing, and so is the generation of good practices (though it wasn't done in a methodical way). Nevertheless, the division's site hasn't been designed using its potential visitors' requirements: 0.67 (lower than company's average). ↓

4 Objectivity – mutual over self assessment (2004)

The objectivity factor, calculated to be 0.49, shows N has worsened their self assessing capability even lower than last year. ↓

15.8 Pattern of performance

	Success Parameter		N		Improvement		Pattern
			2003	2004	Av.	Lead/lag	
PDM	Number of KM procedures		5	5			
	Number of measures		5	5			
		Performance	3	4			↑
		Throughput	1	-			↓
		Business result	1	1			
	Achievement of goals		50%	80%			↑
	Number of actions		7	7			
	Follow up on actions		-	-			↓
	KM programme participation		11	7			↓
M/A	Mutual assessment grade		0.66	0.93	2.11	67%	↓
		Managing and tracking of the programme	0.85	1	1.73	68%	↓
		Capturing knowledge	0.55	1	1.41	129%	↑
		Retrieving knowledge for reuse	0.86	1	1.02	114%	↑
		Creating knowledge	0.6	1	1.47	113%	↑
		Sharing knowledge	0.95	0.67	1.36	52%	↓

Table 15-4: Division N - Pattern of performance

From the pattern of performance of the N division, one can see decrease of performance with regard to the PDM measures in as much as there are no throughput measures in 2004. Actions still are not managed, and the number of

participating directorates decreased. On the other hand, there is some improvement in the achievements of goals.

The M/A section of the pattern of performance of the N division shows an absolute improvement in performance of all the components of KM (while the performance relative to the company is generally lagging).

15.9 Division analysis

N is the division supplying engineering services to all other aerospace divisions at IAI. As a supplier of engineering effort to them, the division is dependent on other divisions of the aircraft groups. Its organisation is totally technology proficiency oriented. This should have created an environment for cooperation between N and the divisions dependent on it. However, N has created an atmosphere of division-specific knowledge within the division that causes the other divisions to be more dependent on N than it is dependent on them. On the other hand, very little room is left for internal cooperation within the division, since people are mainly involved with engineering design within their discipline. Interdisciplinary and interdivisional cooperation is happening whenever people are involved in projects organised around 'integrated product teams' (IPT). Such a background is probably not very helpful for the implementation of the KM programme by the knowledge manager **(self-perception)**.



The comparison of the achievement of goals between 2003 and 2004 shows improvement, mainly due KM being familiar to more people across the division. The mutual assessment grade also improved (only by 141%) as compared to the company's average (211%). N's knowledge manager was also less realistic in his assessment of his KM performance in 2004 than in 2003, and achieved an objectivity factor of 0.49. The author will try now to explore the behavioural factors in N, hoping they will constitute at least a background if not a rationale to these results.

N's knowledge manager is the change champion of the division. This puts him in a focal and advantageous position for the whole division. Being very senior in the division and belonging to the T300 level, he is able to direct KM implementation but still recognizes the advantage he gets from his management status. He has been active in improving processes through process analysis and trusts that it would promote the division to a leading position in the process knowledge within the company (considered as one of his goals). The publicity of his performance is important to him, yet he doesn't consider KM to affect his success measure **(profile)**.



The knowledge manager took the initiative of introducing a new process for the monitoring and measurement of the knowledge created during the project performance. The process was designed as a software application and latter used in one of the divisions as a pilot, prior to its standardisation across the company. The design and development of this application has been a quite considerable effort **(initiative)**.



The knowledge manager considers himself as being in a position to direct KM (though he stated his dependency on the GM). He is being supported and empowered by the GM with the responsibility and authorization, authority and resources to enforce the KM programme in the division. Nevertheless, he has

been performing the programme without the involvement of the other division's directors (maybe because he didn't feel that this would be supported by the GM) (**management support**¹).

The GM was more resolute than others in attributing to KM credit for improving learning/ adaptation capability, employee skills, enabling better decision making, or a faster response to key business issues. He was also more convinced than others in considering KM aligned with business strategies (such as developing intellectual asset strategy and tactics to support business strategy, relate intellectual property to business use, focusing the KM vision and practice to support and align with enterprise strategy and direction, embedding KM in the business model).



The knowledge manager considers it his task to establish an enterprise of knowledge culture, a culture of continuous learning and an environment of sharing in the division. Yet, he attributed to KM more tangible credits such as being an enabler for improving the NPI process, improving the division's ability to standing up to the CMMI standards and eventually, enhancing product or service quality, or for saving costs. This shows a rather pragmatic attitude to KM playing an important role for **long term values**.



Notwithstanding, he took the initiative of choosing throughput measures in both evaluation years and a business result measure in the first one – measures that could help him relate KM to operational activities, or to some of the division's bottom lines (**relevance**).



The GM of N has nominated a committee of directors in the division to act as a steering committee for KM instead of nominating knowledge leaders in the division. They have been meeting on a quarterly basis to be briefed by the knowledge manager on his progress. The result was of having knowledge leaders the knowledge manager couldn't really activate so that he ended performing the KM programme all by himself. On the other hand, N managed to have four KM procedures actually mentioned in the division's PDM as supporters of the division's operational and business goals (**quality of performance**).



¹ The definition of management support was: 'Management's expression of confidence, sometimes open and public, based on a definition of requirements, taking responsibility for them, and partnering in their achievements; relied upon as a source of authority by the performing level'. This fits very well with the situation at N where the DKM, though senior and high levelled still needs the GM's support to harness the other directors to the program.

Appendix 16: Division S analysis

16.1 GM pattern

The author has used the distribution of GM questions by factors presented in table 6-6 to evaluate and comment upon the answers of the GM of division S. For example, his average answer to questions relating to perception of relevance was 1.9 while the average of all GMs was 2.28 (↑); and his average answer to questions relating to division's self-perception was 3.3 while the average of all GMs was 2.89 (↓). The result, showing mainly positions different than the other GMs average, appears in table 16-1:

Factors	Why	What	How	When
Long term values  ↑	To improve staff attraction and retention; to enhance the ability to develop and deliver knowledge-based goods or services and intellectual capital; because he trusts the values of KM.	Encouraging employees to practice knowledge acquisition by participating in collaborative acquisition.	Active in enhancing the division's intellectual property; believes KM can improve internal collaboration within the organization.	
Management support  ↑	Because KM activity is affecting other corporate commitments; because KM accomplishments are published.		Supports KM and showing it.	
Perception of relevance  ↑	Because it gives him better customer handling; enables better decision making; to promote a leading position in process knowledge within the company; to identify experts in a subject matter; business was positive and it helped.	Active in establishing and leading innovation activity; lecturing about KM only on scheduled events; doesn't believe in incentives.	Thinks they partially perform KM without calling it as such.	Believes they can minimize faults by reusing lessons learned.
Division self-perception  ↓		Open to external sources of knowledge.	Doesn't rely on external experts for KM implementation.	

Factors	Why	What	How	When
Quality of performance  	Exclusivity of the DKM not necessarily required.	Personally leading the monitoring process.	Hasn't creatively added to the established KM programme any additional content.	Capturing knowledge from retiring employees.
Initiative  		Practices knowledge acquisition by directing competence centres to monitor technological advances; support training for specific KM activities.	Doesn't use the division's IAI-Net site for formal internal publishing.	Would include the knowledge manager or leaders at standing morning meetings or at festive event occasions (such as successful test, project delivery).

Table 16-1: Division S - GM behavioural pattern

The GM is aware of the virtues of KM and of its long term values, having participated in the steering committee for the establishment of KM in the company. He is sensitive to the publicity of the scores of KM implementation, supports the programme and claims he shows it. Like others, he too thinks they are performing KM at least partially, though they didn't call it that way. Yet he sees relevance to the business through lessons learned and innovation. S is considering itself as a division totally different than the others and therefore the potential of openness to sharing knowledge is minimal. The GM is personally involved with the monitoring of the programme and is willing to include the DKM in short term activities as project follow-up meetings.

16.2 DKM pattern

The author has used the distribution of DKM questions by factors presented in table 6-7 to evaluate and comment upon the answers of the DKM of division S. For example, his average answer to questions relating to perception of relevance was 2 (the highest in the company), while the average of all DKMs was 2.54 (); and his average answer to questions relating to management support was 2.9 while the average of all DKMs was 2.62 (). The result, showing mainly positions different than the other DKMs average, appears in table 16-2:

Factors	Why	What	How	When
Long term values  	Trusts the virtues of KM to increase innovation; tends to limit it to technical activities.			

Factors	Why	What	How	When
Management support  	Partially because the GM recognizes and supports KM efforts; believes the GM is looking for ROI on KM.		The GM is partially supporting and showing he supports the KM programme; directors are partially participating in KM efforts.	Sometimes asks the GM to take active part in KM events.
Perception of relevance  	Using business result measures helps in 'selling' the programme to management.	Believes incentives can help motivate employees to perform KM; the monitoring programme is meant to assess the impact KM performance has on operational or business results.	Believes KM can improve internal communication within the organization.	Believes KM can minimize faults and maximize profits; doesn't deny the relevance of KM in short term activities.
Quality of performance  	Believes that using throughput measures helps in 'selling' the programme to people who have to implement it.	New knowledge is generated mainly from the project activity; communicating KM at some levels of personnel; the monitoring process' rate and intensity are based on the division's operational results and on the KM performance results	Thinks the division performs KM without calling it as such.	Sees a role to the knowledge managers or leaders in a case of emergency.
Profile  	Relates KM to IT or to the change process; sensitive to the publicity of KM results; the criteria for measuring his success depends on KM performance.	Takes pride at the division's KM accomplishments.	Ready to rely on experts external to the division, for KM implementation.	It is crucial for the knowledge manager to be part of the management staff of the division.
Initiative  		Active in improving processes through process analysis; active in securing sponsorship.	Active measuring knowledge resources; doesn't consider KM as a recommendation only.	Allocates time to KM on a regular basis rather than responding to requests.

Table 16-2: Division S - DKM behavioural pattern

The DKM doesn't really relate KM to long term values and rather sees its potential in reusing existing knowledge. He feels he is partially supported by the GM, who for instance didn't help him in tying the directors to the process. His views also differ with those of the GM with regard to incentives. He trusts throughput and business results measure could help him market the

programme. The DKM doesn't consider KM limited to the handbook, believes they have done some of it unofficially and is proud of the division's KM accomplishments. He recognizes the advantage of his being part of the management staff and is active in process analysis.

16.3 Division exploratory pattern

Combining the GM and the DKM patterns, and moderating it with information the researcher has from observing the division closely, some of it appearing in the 'table shells', one would get an integrated picture of the behavioural factors relevant to division S and labelled with the positive/negative arrow next to the icon signalling the general impact the factor would have on KM implementation as related to the given factor:



1. Division's main business, situation and self-perception

The S division serves as a single-site source for the maintenance, repair, and overhaul, conversion and testing of civil and military aircraft major components.

1.1 Dependence on other divisions

The division is dependent partially on the other divisions of its group but is generally very different than the other divisions of the company.

1.2 Horizontal versus vertical organization

The division's organisation is mainly technology proficiency oriented and the knowledge manager believes it could only partially be the reason for a higher knowledge sharing potential and an increase in the value of the intellectual property.

1.3 Awareness for division-specific or product-specific knowledge

There is awareness for division-specific and product-specific knowledge within the division, these are cultivated, and they are used to enhance the division's intellectual property.

1.4 Openness to knowledge from external sources

The GM claims he practices knowledge acquisition by soliciting knowledge from external sources (such as advice/perceptions from customers, suppliers, or consultants, or by reviewing professional literature. The knowledge manager was more sceptical about this statement.

1.5 Openness to using external experts

As most others do, the GM objects using external expertise for the implementation of KM in the division. The knowledge manager was less adamant about this and didn't object it. He even partially agreed to the outsourcing of the knowledge manager position.

1.6 The business situation and its effect on KM performance

Both the GM as well as the knowledge manager considered the business during the evaluation period to be satisfactory. The GM considered it to have a positive effect on the implementation of the KM programme (not corroborated by the knowledge manager).



2. The profile of the division's knowledge manager

2.1 Managerial level

The knowledge manager belongs to the T1000 level.

2.2 Position

The knowledge manager is the deputy director for organisation and information systems.

2.3 Seniority

He is very senior in the division and was appointed ever since the beginning of the programme in August 2002.

2.4 Importance attributed to the managerial level

He believes his managerial position, and being part of the management staff of the division are attributes for the implementation of KM.

2.5 Importance attributed to seniority

He believes his seniority is an attribute for the implementation of KM.

2.6 Importance attributed to publicity

The publicity of his performance is important to him, and he considers KM to affect his success measure.

2.7 Exclusivity in dealing with KM

He also says he would have it led by people dedicated only to KM.

2.8 Relationship to other tasks

He considers KM to be mutually related to IT, QM and change.

2.9 Pride for KM

He is prouder than most knowledge managers of the KM accomplishment of his division.

2.10 Ambition to promote the division to a leading position in process knowledge

The knowledge manager claims he is active in improving processes through process analysis, as promoting the division to a leading position in the process knowledge within the company is one of his goals.



3. Attitude to long term values

3.1 KM as an enabler of long term values

The knowledge manager considers KM as an enabler to increase innovation, to enhance the division's NPI ability, and its intellectual capital. In all of them he finds the GM as a partner to this attitude.

The GM believes KM can improve internal communication and collaboration within the organization. He is in a position to value the virtues of KM more than any other GM (having been part of the steering committee who decided originally on the KM strategy for IAI).

3.2 KM as an enabler of short term values

The knowledge manager considers KM as an enabler to enhance the division's NPI ability, and its intellectual capital.

3.3 Culture as a management task

He considers it his task to enhance sharing in the division. He also values process knowledge and claims to be active in improving processes through process analysis, enhancing the division's intellectual property, and advocating sharing good practices.

The GM, as most others, is taking a leading position in establishing an enterprise of knowledge culture, a culture of continuous learning, and an environment of sharing.



4. The relationship with management



4.1 Dependence on the GM

The knowledge manager is dependent and influenced by the GM position.

4.2 GM's dependence on corporate

The GM supports KM because top corporate management recognizes and supports knowledge management efforts. He is also influenced by the fact that KM performance is published.

4.3 Pride for KM

The GM gave a rather weak answer to the question whether he took pride at the division's KM accomplishments (such as lecture about it outside the division).

4.4 GM's recognition that KM is part of his success criteria

He considers KM as being part of the criteria for measuring his success.

4.5 Knowledge manager's empowerment by the GM

He feels only partially empowered by the GM with the responsibility and authorization, authority and resources to enforce the KM programme in the division though the GM stated he empowers the knowledge manager.

4.6 GM's explicit support

The knowledge manager claims he is shown only partial active support from the GM. The GM stated he does show his support to KM, yet he admitted he only partially takes active part in KM events.

4.7 GM's recognition of doers

The GM claims he openly recognizes doers.

5. The perception of relevance KM has with the division's performance



5.1 KM as an enabler for improved capability

The GM considers KM as an enabler to implement new or better ways of working, to identify experts in a subject matter, to improve learning or adaptation capability, and the competitive advantage, and to promote a leading position in process knowledge within the company. The GM also considers KM as related to results – managing customers' knowledge, improving productivity and even to increase market share.

5.2 KM as an enabler for improved performance

The knowledge manager as well as the GM considers KM as an enabler to improve operational performance and results. Both consider KM to be relevant to operational issues as minimizing faults through lessons learned as well as to business issues as maximizing profit. Both believe in managing customer knowledge to increase value to customers and their loyalty and consider KM can enhance product or service quality.

5.3 Using incentives to promote KM

The DKM believes (contrary to the GM's position) incentives aligning recognition to results can help motivate KM performance.

5.4 The validity of return on investment on KM

The GM is looking for ROI of KM efforts in terms of results measures. The knowledge manager fulfilled the GM expectation for return on the investment made for KM implementation by picking in 2004 business result measures for the programme.

5.5 The applicability of KM below the management level

Both the knowledge manager and the GM understand KM is not only applicable to management and it has indeed penetrated below it.

5.6 Knowledge managers as participants in short term activities

Both considers the knowledge manager to be relevant to short term issues as well (the GM would even consider the knowledge manager as a possible participant at 'standing morning meetings' – typical to urgent and short term activity).

5.7 Using throughput measures to 'sell' KM to personnel

He believes that using throughput measures helps in 'selling' the programme to people who have to implement it, and actually does it.

5.8 Using business result measures to 'sell' KM to management

He uses business results measures to help him 'selling' the programme to management.

6. The level of initiative on the part of the knowledge manager



6.1 Time allocated to KM

The knowledge manager allocates 20% of his time to KM on a regular basis.

6.2 Consideration of KM as a recommendation only

The knowledge manager doesn't consider KM as a recommendation only.

6.3 Securing sponsorship

The knowledge manager claims he is active in securing sponsorship (such as obtaining management buy-in, making sure management understands and is ready to promote KM).

6.4 Creative contributions to the programme

The knowledge manager took the initiative of introducing a software tool meant to derive insight from lessons learned but failed in implementing it. He also volunteered the division to be a pilot for the implementation of a content management system but latter realised the difficulties involved in convincing people to use it.



7. The programme performance



7.1 Belief KM has been performed without calling it as such

The knowledge manager considers the division to perform KM though not necessarily according to the established procedures.

7.2 Organising for KM

He only partially maintains the establishment of the infrastructure needed for KM (such as managing the knowledge leaders, having a plan for the implementation and its monitoring process).

7.3 Activity in performing KM

The knowledge manager is coaching employees for capturing knowledge and sharing it. He believes new knowledge is generated mainly from the project activity. He is active at identifying critical knowledge, leading the activity needed

to capture it, encouraging employees to participate in it, and establishing competence centres.

The GM claims he is active in enhancing the division's intellectual property (such as obtaining patents). He is taking a leading position in promoting the division to a leading position in the process knowledge within the company.

7.4 Communicating KM

As opposed to most knowledge managers, he admits communicating KM only partially to all levels of employees.

7.5 Monitoring KM

There is a monitoring process established in the division for the KM programme claimed to be adaptive to the division's operational results or at least to the KM performance and it is lead by the knowledge manager with the involvement of the GM. The knowledge manager states that it is meant to assess the impact KM performance has on operational or business results.

16.4 Interviews as a reinforcement to the exploratory phase

The interview was conducted with S's GM and DKM six months after they have filled the questionnaires (for details about the structure of the interview see section 5.6.1). Referring to the three subjects handed over for discussion to the respondents ahead of the interview, this is a list of indicative quotes they made:

Linking KM to business

GM: "In deciding upon the KM procedures for the division, we looked for something which would be measurable and that would be clearly related to the business. Monitoring the lessons learned from the debriefing we conduct after any major component failure, seemed as a perfect case for it. Everybody in the division realizes the business loss potential embedded in any failure case, and anybody would tell you it has to be fully debriefed. The problem starts with the administration related to reporting the lessons learned, so the knowledge manager took care of it. Most also don't relate the subject to knowledge management". The GM instructed the knowledge manager on the spot to issue a communication explaining the value chain of the process and its relation to knowledge management. "What I really would like is for the team accepting a major component for inspection not to start before studying and documenting the paperwork stating the reason for its shipment to us. The inspection and maintenance data would add to it and so will be the malfunctions if these occur prior to reshipment. The lessons learned from the debriefing which would then be conducted, would be related to all the prior information. A different major component coming to us for a similar reason will then find a better prepared team, armed with all the prior experience".

DKM: "We have been trying to implement such a system but we were not successful due to the lack of lessons learned reported. We will try again in next year programme".

The researcher acting as the director of knowledge reminded them that lessons learned are potentially in any staff meeting notes and the GM instructed immediately the knowledge manager to nominate a person in charge of deriving lessons learned from the meetings he is chairing. He also wants the knowledge leaders to do the same in the directorates.

DKM: "I think that gathering good practices from the various production cells is another effective way to make KM contribute to the division's business results. We are doing it in the process of digitising route cards by interviewing experts, photographing them in action and incorporating the pictures in the route card. We even encountered cases where the official process was wrong but people still knew what to do".

Monitoring the programme

GM: "The forum of the knowledge leaders is not the tool for monitoring the programme. The division's directors are not interested in it and they don't consider them as their representative for its implementation".

DKM: "I meet with the knowledge leaders every months but it mainly is for enhancing awareness to it and explaining what and how to do. They need to be supported in order to withstand the other priorities of their directors".

GM: To be monitored KM has to be mentioned as an action in PDM3, 4, 5 of the division.

Authority/Responsibility of the knowledge manager

DKM: "My belonging to the management staff of the division helps and I don't have any problem guiding employees through the KM procedures requirements, though I'm not their direct manager."

GM: "Performance is a function of the personality of the knowledge manager. Employees know my attitude to it because they see it in the PDM and because they hear about it at any opportunity I have to talk to them".

DKM: "The knowledge leaders, who are guided by me, need to be supported in order to withstand the other priorities of their directors". There is a gap of awareness to KM between the DKM and the directors, so though the knowledge manager is one of them, he prefers to operate by guiding the knowledge leaders belonging to the various directorate, rather than explaining KM to the directors. This seemed not very successful when the knowledge leaders found out they lacked the backing of their managers – the directors.

To summarize, it seems the GM is eager to put KM to work for the benefit of the division while the knowledge manager is reminding of restraining realities.

The GM would want to harness the directors to the programme, but doesn't trust they can be convinced, and believes the only way to it, is through requiring them to include KM in their directorate's PDM.

16.5 Pattern of behavioural factors

Gathering arrow labels for the behavioural factors relevant to division S one would get the following integrated picture:

Factor	Pattern
Long term values	↓
Management support	↑
Perception of relevance	↑
Division self-perception	↓
Quality of performance	↓
Profile	↑
Initiative	↑

Table 16-3: Pattern of behavioural factors for division S

16.6 PDM pattern

1. KM procedures (2003)

Division S stated in 2003 it was going to deal with only four KM procedures (no procedure was chosen for the creation of new knowledge phase):

- Enhancing the awareness for the programme.
- Managing the knowledge from lessons learned.
- Managing the knowledge in price proposals.
- Using the division IAI-Net portal to share knowledge.

2. KM measures (2003)

To each of these procedures it matched a measure (none of them throughput or business result measures) with a goal:

- KM programme presentation to managers (performance measure): 25
- Number of 'insights' developed from lessons learned (performance measure): 5
- Number of proposals managed and documented in the database (performance measure): 40
- Number of practices recommended as 'Good Practices' (performance measure): 12
- Number of employees visiting the division's IAI-Net site on a monthly basis (performance measure): 40

3. KM Actions and directorate participation to enable goal achievements (2003)

- Programme presentation to T1000 staff.
- Establishment of the 'insights' database.
- Establishment of the proposals database.
- Gathering and publishing of 'Good Practices'.
- No action was ascribed to the division's IAI-Net site.

Actions were attributed to all directorates (though there were no knowledge leaders to lead them).

4. Achievements of goals (2003)

The KM programme was not quite monitored in 2003 so for most of the goals there is no reliable information on their achievements. The only exceptions are:

- The KM programme was not presented at all to the T1000 level.
- Information from major components testing was gathered as lessons learned.
- No price proposals generated using the structured method.
- There was no evidence to 'good practices' being gathered.

5. KM procedures (2004)

In 2004 IAI has updated the Policy Deployment Model (PDM) in such way that only one procedure by KM phase could be chosen. S chose the following procedures:

- Enhancing the awareness for the programme.
- Extracting knowledge from lessons learned (from the capturing and documenting knowledge phase).

Managing the knowledge being created in projects (from the creating new knowledge phase).

No procedure was chosen from the retrieving knowledge for reuse phase.

No procedure was chosen from the sharing knowledge phase.



6. KM measures (2004)

To each of these procedures it matched a measure with a goal:

Procedures identified as contributors to the division's results (business result measure): 2 procedures.

Lowering failure rate in major component tests due to implementation of lessons learned (business result measure): from 17.8% to 10%.

Lowering failure rate in tools department due to implementation of lessons learned (business result measure): from 4% to 3%.

Lowering rework effort in major component overhaul due to implementation of lessons learned (business result measure): from 4000hr to 3000hr.

Number of debriefing events (performance measure): 5

Knowledge being created through the New Product Initiation (NPI) process is collected and documented (performance measure): 100%

The fact that the knowledge manager chose 4 business results measures is very positive because it readily connects the KM programme to the operational or business goals of the division.



7. KM Actions and directorate participation to enable goal achievements (2004)



Implementation of the debriefing process across the division, by the knowledge leader from the QM directorate.

Implementation of lessons learned in the major component testing directorate.

Implementation of lessons learned in the tools directorate.

Implementation of lessons learned in the overhaul directorate.

Establishment of the NPI process for a new major component type.

In 2004, the knowledge manager distributed tasks among the knowledge leaders.



8. Achievements of goals (2004)

The PDM system in 2004 enabled the knowledge managers to actually update their achievements along the year, according to their goals (which were also distributed on a monthly or quarterly basis):

Actions in the division's PDM implemented using KM procedures: 2 actions.



Failure rate in major component tests due to implementation of lessons learned lowered from 17.8% - to 10%.



Failure rate in tools department due to implementation of lessons learned lowered from 4% – to 3%.



Rework effort in major component overhaul due to implementation of lessons learned lowered from 4000hrs – to 2445hrs.



Number of debriefing events: 11



Knowledge being created through the New Product Initiation (NPI) process is collected and documented. ↑

16.7 Mutual assessment pattern

1. Self and Mutual assessment grade (2003)

Division S graded itself at 0.21 (regarding only the management and implementation phase, the capturing phase, and the retrieving phase of the programme). The mutual assessment grade was 0.3 divided as follows:

1.1 Managing and tracking of the programme (2003)

No organisation was established for the KM programme except for the appointment of the knowledge manager (lower than company's average): 0.55 ↓

1.2 Capturing and documenting knowledge (2003)

The knowledge manager stated having a list of needed knowledge from the various directorates, from which he will develop a plan of action. Lessons learned were gathered from one type of major components only (higher than company's average): 0.65 ↑

1.3 Retrieving knowledge for reuse (2003)

The establishment of the competence centres was based on an old list of such centres. Works need to be done to update the competence centres (lower than company's average): 0.5 ↓

1.4 Creating knowledge (2003)

There was no achievement to assess: 0 ↓

1.5 Sharing knowledge (2003)

There was no achievement to assess: 0 ↓

2. Objectivity – mutual over self assessment (2003)

The author is considering an objectivity factor of between 0.8 and 1.2 as sign of reality for the division assessing its own performance. This is definitely an advantage to whoever is interested in corrective action, as it positions the division in a closer position to where it should be. The objectivity factor, calculated to be 1.43, shows S to be not confident enough about their KM achievement. ↓

3. Self and Mutual assessment grade (2004)

S graded itself higher than in 2003 at 1.67. The mutual assessment grade was 1.3 divided as follows: ↑

3.1 Managing and tracking of the programme (2004)

Knowledge leaders were nominated and they are active in their directorates: 1.67 (higher than company's average). ↑

3.2 Capturing and documenting knowledge (2004)

Each directorate specified a list of subjects to capture knowledge about and prioritised it: 1.5 (higher than company's average). ↑

3.3 Retrieving knowledge for reuse (2004)

The list of competence centres was updated. A database for proposals was established: 1 (higher than company's average). ↑

3.4 Creating knowledge (2004)

New knowledge created for one type of major components is now used in another: – 0.5 (lower than company's average). ↓

3.5 Sharing knowledge (2004)

Participation in communities of practice is growing: 1 (higher than company's average). ↑

4 Objectivity – mutual over self assessment (2004)

The objectivity factor, calculated to be 0.78, shows S improved their self assessing capability to a point just below the realistic range. ↓

16.8 Pattern of performance

	Success Parameter		S		Improvement		Pattern
			2003	2004	Av.	Lead/lag	
PDM	Number of KM procedures		4	3			↓
	Number of measures		5	6			↑
		Performance	5	2			
		Throughput	-	-			
		Business result	-	4			↑
	Achievement of goals		25%	100%			↑
	Number of actions		4	7			↑
	Follow up on actions		-	100%			↑
	KM programme participation		10	10			
M/A	Mutual assessment grade		0.3	1.3	2.11	205%	↑
		Managing and tracking of the programme	0.55	1.67	1.73	176%	↑
		Capturing knowledge	1.3	1.5	1.41	82%	↓
		Retrieving knowledge for reuse	0.5	1	1.02	196%	↑
		Creating knowledge	0	0.5	1.47		↑
		Sharing knowledge	0	1	1.36		↑

Table 16-4: Division S - pattern of performance

From the pattern of performance of the S division, one can see clear improvement of performance with regard to the PDM measures in as much as there are four business results measures in 2004. A major drawback is in the fact that two procedures are missing. On the other hand, all actions are now managed, and the whole division (ten directorates) participates. Moreover, achievements of goals have reached a level of 100%.

The M/A section of the pattern of performance of the N division also shows a clear improvement in the absolute values of the performance of all the components of KM. The overall score improved by 433% - second to the highest in the company, (the 2003 one was remarkably low and the 2004 one

was remarkably high); and only in the field of knowledge capturing, the division improved though less than the company's average.

16.9 Division analysis

S is a division which technology is comparable only to the T division (belonging to the same group). Its line of business is quite comparable (and sometimes interdependent) with those of the other divisions of the RST group. Nevertheless, it considers itself different and separate from the others. The main characteristics of S's business is the turnover of overhauling a limited number of types of major aircraft components, their high number coming in (and sometimes coming back), the expensive technology involved in it, and the high price tag for the overhaul of each one. Such a background and S's dependence on OEM's know-how were the reason the main procedure for the first two years was the one dealing with lessons learned (**environment**).

Comparing the achievement of goals between 2003 and 2004 shows a remarkable improvement - 433%, second to the highest in the company - 464%, mainly due to effort applied in the organisational field (the nomination of knowledge leaders. S's knowledge manager was more realistic in his assessment of his KM performance in 2004 than in 2003, but he still shows some overconfidence. The author will try now to explore the behavioural factors in S, hoping they will constitute at least a background if not a rationale to these results.

S's knowledge manager is in charge of information systems. This puts him in a focal and advantageous position in the division and also enables him to link the process side of KM to its technological aspect (**profile**). It wasn't surprising to get him to volunteer for the pilot of a content management system being implemented in the company (**initiative**). The position of the S knowledge manager on the hierarchical management ladder is such that it is easy for him to establish a knowledge management organization and to get approval for the appointment of knowledge leaders across the division (**profile**).

Having been part of the steering committee who decided originally on the KM strategy for IAI, S's GM is a natural supporter of KM though he doesn't show it openly (**management support**).

The GM has a positive attitude toward **long term values**¹. Beyond this being a favourable background for the development of KM in general, it would suggest a tendency to increase the creation of new knowledge. This hasn't been demonstrated in S, maybe because the DKM was more interested in the management of existing knowledge (typical of his IT background).

S's knowledge manager chose business results measures in 2004 (as a sign of recognition of the **relevance** the programme has to business, and as opposed to his choice in 2003). This is a sign of initiative on his part since he could very easily omit it as many other knowledge managers did. He was probably influenced by the need his GM expressed to get



¹ The definition of long term values is 'qualities one should care for because they are expected to be advantageous in the long run for the benefit of the individual and of the division', but beyond the claim the GM is making for it, it hadn't materialized, maybe because of the DKM.

tangible results to the programme.

The knowledge manager introduced (**initiative**), a software tool meant to derive insight from lessons learned but had difficulties in implementing it.

This could be because he relied more than he should have on the IT part of the tool and didn't invest enough in the process and the advantages the division could gain from it.



S's knowledge manager failed to implement a procedure in each of the four phases of the programme in both years (2003 was lacking a procedure in the creation of new knowledge field, and in 2004 he didn't have procedures for the retrieving knowledge and sharing knowledge fields) (**quality of performance**).



Appendix 17: Division U analysis

17.1 GM pattern

The author has used the distribution of GM questions by factors presented in table 6-6 to evaluate and comment upon the answers of the GM of division U. For example, his average answer to questions relating to perception of relevance was 2.7 while the average of all GMs was 2.28 (↓); and his average answer to questions relating to division's self-perception was 2.7 while the average of all GMs was 2.89 (↑). The result, showing mainly positions different than the other GMs average, appears in table 17-1:

Factors	Why	What	How	When
Long term values  ↓	Because top corporate management recognizes and supports knowledge management efforts; not necessarily to enhance the division's intellectual capital.	Doesn't encourage the employees to practice knowledge acquisition by participating in collaborative acquisition.	Learning from observing failed/successful efforts in the division or in others; has an active programme for the promotion of innovation in the division; active in improving processes through process analysis; advocates sharing the division's good practices with others and other's good practices.	
Management support  ↑	Because top corporate management recognizes and supports knowledge management efforts; considers the publicity of KM accomplishments as not relevant.		Active increasing employees' empowerment.	
Perception of relevance  ↓	Not necessarily to save costs; the business situation was not satisfactory and yet it partially helped.	Has established incentives for KM implementation; not active in establishing and leading multi-divisional communities of practice.		Believes faults can be minimized by reusing lessons learned.

Factors	Why	What	How	When
Division self-perception  			Open to external experts for KM implementation.	
Quality of performance  	Believes it has to be led by people who deal with it exclusively.	Personally leading the monitoring process for KM implementation.	Empowering the DKM; there is no established KM organisation beyond the knowledge manager, or the GM is not satisfied with its operation.	Active capturing knowledge from retiring employees.
Initiative  		Doesn't take pride at the division's KM accomplishments and doesn't lecture about it; supports training for specific KM activities; directs practicing inside and outside reusing.	Active increasing employees' empowerment; relies on meetings to transfer knowledge all the way through the hierarchy ladder.	Includes the knowledge manager or leaders at staff meetings; doesn't consider a role to KM in emergency cases and other operational activities; would recognize the knowledge manager together with the project team.

Table 17-1: Division U - GM behavioural pattern

The GM is aware of the virtues of KM and of its long term values, but he is also guided by the fact that corporate requires it. He claims that the publicity of the scores of KM implementation is irrelevant. He supports the programme, claims he shows it, and is personally involved with its monitoring. From the GM's questionnaire answers there doesn't seem to be any relevance to KM in U's business, though KM is an inherent part of U's activity. U is totally dependent on the other divisions and therefore the potential of openness to sharing knowledge should be maximal. The GM doesn't consider the DKM appropriate to short term activities as project follow-up meetings.

17.2 DKM pattern

The author has used the distribution of DKM questions by factors presented in table 6-7 to evaluate and comment upon the answers of the DKM of division U. For example, his average answer to questions relating to perception of relevance was 2.4 while the average of all DKMs was 2.54 (); and his average answer to questions relating to long term values was 2.8 while the average of all DKMs was 2.66 (). The result, showing mainly positions different than the other DKMs average, appears in table 17-2:

Factors	Why	What	How	When
Long term values  	To increase innovation and to enhance the ability to develop and deliver knowledge-based goods or services.			
Management support  	Believes the GM is looking for ROI on KM.		The GM is actively supporting and showing he supports the KM programme; directors are not participating in KM efforts.	Sometimes asks the GM to take active part in KM events.
Perception of relevance  	To implement new or better ways of working; using business result measures partially helps in 'selling' the programme to management.	Believes incentives can help motivate employees to perform KM; the monitoring programme is meant to assess the impact KM performance has on operational or business results.	Believes KM can improve internal communication within the organization.	Believes KM can minimize faults and maximize profits; doesn't deny the relevance of KM in short term activities.
Quality of performance  	The division was generally busy during the evaluation period and it partially helped; believes that using throughput measures helps in 'selling' the programme to people who have to implement it; explains KM to employees.	Not active in establishing and leading multi-divisional communities of practice; encourages practicing inside and outside reusing; there is a monitoring process established in the division for the KM programme and management is involved in it.	Advocates sharing other's good practices and sharing own good practices with others.	Sees a role to the knowledge managers or leaders even in cases of emergency.
Profile  	Because the criteria for measuring success depends on KM performance, and because KM accomplishments are published.	Partially takes pride at the division's KM accomplishments; reserved about promoting the division to a leading position in the process knowledge within the company being one of his goals.		It is crucial for the knowledge manager to be part of the management staff of the division.

Factors	Why	What	How	When
Initiative 		Active in securing sponsorship.	Not encouraging including suppliers or customers in internal meetings to gather a different perception than the division's; active measuring knowledge resources.	Allocates time to KM on a regular basis rather than responding to requests.

Table 17-2: Division U - DKM behavioural pattern

The DKM is conscientious about the long term value of KM to enhance innovation, and cooperation in the division; yet he doesn't deny to KM a role in everyday emergencies. He feels supported by the GM whom he trusts, wants to see some tangible results. He finds relevance with most of the division's fields of activities. Though he claims to believe that using throughput or business measures could help, he never did it. The DKM would rather keep everything within the division, wouldn't include suppliers and customers in their internal meetings, and this is unexpected from a division so dependent on the other divisions who are both their suppliers and customers. He is sensitive to the publicity of results, considers the KM implementation to be one of the criteria for success, and is somehow proud about their achievements in the subject. He is part of the management staff of the division and attributes to it a great deal of importance.

17.3 Division exploratory pattern

Combining the GM and the DKM patterns, and moderating it with information the researcher has from observing the division closely, some of it appearing in the 'table shells', one would get an integrated picture of the behavioural factors relevant to division U and labelled with the positive/negative arrow next to the icon signalling the general impact the factor would have on KM implementation as related to the given factor:

1. Division's main business, situation and self-perception



The U division deals with services to the company's employees as well as to its customers. Searching, accumulating, processing, generating, packaging, and the transferring of knowledge are the business of U.

1.1 Dependence on other divisions

The division is dependent on all the other divisions for its business and in fact, at the beginning of the programme, the GM stated his intention to use KM in order to position U with regard to the company.

1.2 Horizontal versus vertical organization

The division is organised around two branches, and is mainly function proficiency oriented and this should help the knowledge sharing potential and the value of the intellectual property.

1.3 Awareness for division-specific or product-specific knowledge

The knowledge manager answered this question positively (the GM didn't answer it), maybe relating to the persistent perception at U that in too many cases, they find their customers at the various divisions ready to be self-suppliant for their services. It is not unusual therefore to find people at U very much aware for their division-specific or product-specific knowledge, and these are used to enhance the division's intellectual property.

1.4 Openness to knowledge from external sources

The GM was less positive than others when responding to practicing knowledge acquisition by soliciting knowledge from external sources (such as advice/perceptions from customers, suppliers, or consultants, or by reviewing professional literature). By the same token, he was opposed to most others, in denying encouraging employees to practice knowledge acquisition by participating in collaborative acquisition (such as communities of practice outside the company, conventions which have to be documented afterwards). Contrary to most knowledge managers who didn't admit it, and contrary to his GM's position on the issue, the knowledge manager objects including suppliers or customers in internal meetings.

1.5 Openness to using external experts

On the other hand and as opposed to most others, the GM didn't object using external expertise, but only for the technical implementation of KM in the division.

1.6 The business situation and its effect on KM performance

The GM considered the business during the evaluation period of 2003 to 2004 to be less than satisfactory (not remarked by the knowledge manager), but both didn't consider it would have any effect on the implementation of the KM programme.

2. The profile of the division's knowledge manager



2.1 Managerial level

The knowledge manager belongs to the T300 level.

2.2 Position

He is responsible for R&D and the e-learning activity in U.

2.3 Seniority

The knowledge manager is quite senior at U. He is the second knowledge manager to have been appointed for U and has been active since June 2003.

2.4 Importance attributed to the managerial level

As opposed to most knowledge managers, he trusts his managerial position, and him being part of the management staff of the division are only a partial benefit.

2.5 Importance attributed to seniority

He believes his seniority is an attribute for the implementation of KM (he doesn't believe it can be bought from experts).

2.6 Importance attributed to publicity

The publicity of his performance is important to him and he considers KM to affect his success measure.

2.7 Exclusivity in dealing with KM

The GM, as opposed to the knowledge manager, believes KM has to be led by people dedicated only to this task.

2.8 Relationship to other tasks

Considering e-learning to be a way to capture and package knowledge he views KM and e-learning to be mutually related (maybe even interdependent) and is looking at KM as a mean to proliferate e-learning. He states the interdependence between KM and QM as being only partial.

2.9 Pride for KM

The knowledge manager has been very active at communicating KM and e-learning in international conferences; he has lately lead a session in a conference on Enterprise Content Management to present the way U is managing its content management. All this is in direct contradiction with his specific answer to the question on whether he took pride at his division's KM accomplishments (such as lecturing about it outside the division).

2.10 Ambition to promote the division to a leading position in process knowledge

The knowledge manager values process knowledge; but, promoting the division to a leading position in the process knowledge within the company, is not one of his goals.



3. Attitude to long term values



3.1 KM as an enabler of long term values

The knowledge manager considers more than others, KM as an enabler to increase innovation and to enhance the division's ability to develop and deliver knowledge-based goods or services (core of the division).

3.2 KM as an enabler of short term values

On the other hand, he attributes less than others to KM as an enabler to improve the new product introduction (NPI) process and the division's ability of standing up to the CMMI standards (two items to which the GM related to as irrelevant to the division).

3.3 Culture as a management task

The knowledge manager takes a responsible stand on high level issues as considering it his task to enhance a culture of knowledge, continuous learning and sharing.

The GM considers it his task to establish an enterprise of knowledge culture, of continuous learning and an environment of sharing. The GM values the virtues of KM and inter-sharing of good practices; he personally values lessons learned as a source of information (he facilitated the process of events debriefing across the company for the 'One Company' value) though he didn't manage to implement it thoroughly in the division.



4. The relationship with management



4.1 Dependence on the GM

The knowledge manager considers himself dependent on the GM for his KM performance, but not as much as most knowledge managers stated.

4.2 GM's dependence on corporate

The GM supports KM among other reasons, because top corporate management recognizes and supports knowledge management efforts and shows it actively.

4.3 Pride for KM

The GM stated he doesn't take pride at the division's KM accomplishments (such as lecture about it outside the division).

4.4 GM's recognition that KM is part of his success criteria

The GM stated that the criteria for measuring success are based on the organization's mission, objectives, and goals and KM is only partially part of them.

4.5 Knowledge manager's empowerment by the GM

The knowledge manager feels empowered by the GM with the responsibility and authorization, authority and resources to enforce the KM programme in the division.

4.6 GM's explicit support

The knowledge manager considers himself as being actively and openly supported by the GM. He doesn't see such support from the other directors (no performance and no monitoring).

4.7 GM's recognition of doers

The GM stated he advocates recognition and practices it when inviting doers to present their achievements at management staff meetings.



5. The perception of relevance KM has with the division's performance ↓

5.1 KM as an enabler for improved capability

The knowledge manager as well as the GM considers KM as an enabler to implement new or better ways of working, less so about enabling better decision making.

5.2 KM as an enabler for improved performance

The knowledge manager as well as the GM considers KM as an enabler to enhance product or service quality. The GM was less articulate than others on these issues (he for instance didn't attribute to it any virtue for cost cutting).

5.3 Using incentives to promote KM

The knowledge manager believes incentives aligning recognition to results can help motivate KM performance.

5.4 The validity of return on investment on KM

The knowledge manager believes he has to show results as return on investment - ROI (though he thinks it could only partially be used as a selling pitch for the programme).

5.5 The applicability of KM below the management level

Both the knowledge manager and the GM understand KM is not only applicable to management yet there is no evidence it has penetrated below it.

5.6 Knowledge managers as participants in short term activities

The GM objects using the knowledge manager for short term and urgent activities and sees in him more of a marathon runner (contrary to most GMs who didn't admit it).

5.7 Using throughput measures to 'sell' KM to personnel

Most knowledge managers denied using throughput measures to help them in 'selling' the programme to people who have to implement it. U's thought it could partially help. Yet, he didn't choose any throughput measures along the evaluation period.

5.8 Using business result measures to 'sell' KM to management

Most knowledge managers denied using business result measures to help them in 'selling' the programme to management. U's thought it could partially help. Nevertheless, he has never picked so far business result measures for the programme (neither in 2003, 2004, nor even in 2005).



6. The level of initiative on the part of the knowledge manager



6.1 Time allocated to KM

The knowledge manager claims to allocate 20% of his time to KM on a regular basis.

6.2 Consideration of KM as a recommendation only

As most knowledge managers, ours too doesn't consider KM as a recommendation only.

6.3 Securing sponsorship

The knowledge manager claims he is active in securing sponsorship (such as obtaining management buy-in, making sure management understands and is ready to promote KM).

6.4 Creative contributions to the programme

The knowledge manager initiated a directory of experts about widely used software packages.

The GM initiated a directory of expertises employees have beyond their official task.

The GM initiated a programme to enhance innovation by gathering a group of people from various parts of the division in order to come up with innovative ideas for the division – a perfect case of new knowledge creation.



7. The programme performance



7.1 Belief KM has been performed without calling it as such

The knowledge manager thinks the division has been performing KM so far without calling it as such. This reflects an attitude of complacency, which has been delaying so far the knowledge manager from taking firm steps in the implementation of KM.

There is an established KM organisation beyond the knowledge manager's appointment but he is only partially satisfied with the way it functions.

7.2 Activity in performing KM

In spite of the natural need the division has for sharing, the knowledge manager was not active in establishing multi-divisional communities of practice, or in encouraging employees to participate in them. He was more adamant than others in stating holistic approach in dealing with knowledge items, along all their life cycle (capturing, creating and documenting it, retrieving it for reuse and sharing it) rather than dealing with each action by itself.

7.3 Communicating KM

There are no lectures about values as sharing, innovation, or reuse given in the division; so when the knowledge manager stated that he explains KM to employees (such as communicating the results of activities, making the concepts real, using successful practices as examples, demonstrating the

individual and group value of shared knowledge), this should be seen as an outstanding activity.

7.4 Monitoring KM

There is a monitoring process established in the division for the KM programme and it is lead by the GM himself, though from the questionnaire information it seems it is not meant to assess the impact KM performance has on operational or business results. The knowledge manager also corroborated this information.

17.4 Interviews as a reinforcement to the exploratory phase

The interview was conducted with U's GM and DKM three months after they have filled the questionnaires (for details about the structure of the interview see section 5.6.1). Referring to the three subjects handed over for discussion to the respondents ahead of the interview, this is a list of indicative quotes they made:

Linking KM to business

GM: "Knowledge is part of anything we do at U. The slogan of the division is: U, it's all about knowledge".

DKM: "We create knowledge and reuse it".

GM: "We haven't been successful in establishing 'yellow pages' about the expertise of U's employees". The knowledge manager added that he had a similar experience with the directory of experts about widely used software packages. In the first case employees didn't join in, while in the second, they didn't use it. The same can be said about gathering 'lessons learned' and using them.

What seems to work better are cooperative forums – the GM related to a gathering of 'inventors', once every two weeks, to come up with innovative ideas; he has even initiated a forum of secretaries who feel flattered for being consulted.

Monitoring the programme

The GM monitors the programme on a monthly basis.

Though the knowledge manager stated his belief in having to show tangible results to his GM, he didn't choose throughput or business results measures in both years. Nevertheless, the GM doesn't believe to be able to close the loop on 'return on investment'. He also reported a case of disagreement with unions' representatives when trying to implement it.

Authority/Responsibility of the knowledge manager

The knowledge manager considers himself to be responsible for culture, processes and also results.

GM: "The position of the knowledge manager within the organization is a message about the GM's stand on the programme. That is why he has to belong to the management staff of the division".

The GM stated he is being recommended about employees to recognize and he summons them to staff meeting and tell their story in front of all other directors. There is no evidence of the knowledge manager using this opportunity to encourage the participants in the programme, and this contradicts his statement about his actions to secure sponsorship for the programme.

To summarise, it looks like the knowledge manager was given all the leash he could ask for, but he didn't use it.

17.5 Pattern of behavioural factors

Gathering arrow labels for the behavioural factors relevant to division U one would get the following integrated picture:

Factor	Pattern
Long term values	↓
Management support	↓
Perception of relevance	↓
Division self-perception	↑
Quality of performance	↓
Profile	↑
Initiative	↑

Table 17-3: Pattern of behavioural factors for division U

17.6 PDM pattern

1. KM procedures (2003)

U took upon itself in 2003, 7 goals – 5 KM procedures (none from the creating knowledge phase), and 2 additional goals not formally defined by the KM handbook:

- 1.1 Enhancing the awareness for the programme.
- 1.2 Engineering knowledge capture.
- 1.3 Operating competence centres.
- 1.4 Managing the knowledge in price proposals.
- 1.5 Using the division IAI-Net portal to share knowledge.
- 1.6 Process development for training and publication.
- 1.7 Implementing KM procedures.

2. KM measures (2003)

To each of these procedures it matched a measure (one of them throughput measure) with a goal:

- 2.1 KM programme presentation to the T1000 level (performance measure): 100%
- 2.2 Scope of 'Help' capability developed for the product data management system (performance measure): 40 items
- 2.3 Number of employees with distinct expertise logged in the data base (performance measure): 30
- 2.4 Number of price proposals generated using the structured method (performance measure): 10
- 2.5 Number of new systems having a 'Help' capability (performance measure): 5
- 2.6 Number of 'insights' developed from lessons learned (throughput measure): 5
- 2.7 Number of employees in the company exposed to e-learning (performance measure): 1000

3. KM Actions and directorate participation to enable goal achievements (2003)

- 3.1 Knowledge manager to organise programme presentation.
- 3.2 Knowledge leader in the publications directorate to prepare the template to be used as database for experts.
- 3.3 Knowledge leader in charge of QM and change to lead the action for generating 'insights' from lessons learned.
- 3.4 Knowledge leader from the training directorate to lead the action for the development of 'help' capabilities.
- 3.5 Knowledge leader from the marketing directorate to propose structured price proposal model as a pilot.

Distributing tasks among the knowledge leaders is positive since it involves the various directorates into the programme. ↑

4. Achievements of goals (2003)

The KM programme was not quite monitored in 2003 so for most of the goals there is no reliable information on their achievements. The only exceptions are:

- 4.1 The KM programme was not presented at all to the T1000 level. ↓
- 4.2 It's not clear to what extent was the 'help' capability for the product data management system enhanced. ↑
- 4.3 Over 100 software experts logged in the data base. ↑
- 4.4 Only a minimal number of employees with distinct expertise logged in the data base. ↓
- 4.5 No price proposals generated using the structured method.
- 4.6 No 'insights' developed from lessons learned. ↓
- 4.7 The number of employees in the company exposed to e-learning is not clear. ↑

5. KM procedures (2004)

In 2004, the Policy Deployment Model (PDM) has been updated in such way that only one procedure by KM phase could be chosen. U chose the following procedures:

- 5.1 Enhancing the awareness for the programme.
- 5.2 Extracting knowledge from lessons learned (from the capturing and documenting knowledge phase).
- 5.3 Managing the knowledge in price proposals (from the retrieving knowledge for reuse phase).
- 5.4 Again, no procedure was chosen from the creating new knowledge phase. ↓
- 5.5 Using the division IAI-Net portal to share knowledge (from the sharing knowledge phase).

6. KM measures (2004)

To each of these procedures it matched a measure (again, one of them throughput measure) with a goal:

- 6.1 KM programme presentation to the T14000 level (performance measure): 4 events
- 6.2 Number of lessons learned (performance measure): 30

6.3 Percentage of price proposals generated using the structured method (performance measure): 10%

6.4 Number of employees using the division IAI-Net site on a monthly basis (throughput measure): 200

The fact that the knowledge manager chose a throughput measure is positive because it relates the KM programme to the operational goals of the division.



7 KM Actions and directorate participation to enable goal achievements (2004)

7.1 Knowledge manager to organise programme presentation.

7.2 Knowledge leader in the publications directorate to install 2 databases, one for software experts and one for employee expertises.



7.3 Knowledge leader in charge of QM and change to conduct debriefings and generate lessons learned from them.

7.4 Knowledge leader from the marketing directorate to install a structured price proposal tool.

In 2004 too, the knowledge manager distributed tasks among the knowledge leaders.



8 Achievements of goals (2004)

The PDM system in 2004 enabled the knowledge managers to actually update their achievements along the year, according to their goals (which were also distributed on a monthly or quarterly basis):

8.1 The KM programme was presented to the T1000 level: 5 events



8.2 The 2 databases were installed and the number of employees using the division IAI-Net site on a monthly basis: 264



8.3 Number of lessons learned: 11



8.4 Percentage of price proposals generated using the structured method: 0%



17.7 Mutual assessment pattern

1. Self and Mutual assessment grade (2003)

U graded itself quite conservatively at 0.48 (regarding only the management and implementation and the sharing phases of the programme). The mutual assessment grade was 0.54 divided as follows:

1.1 Managing and tracking of the programme (2003)

Awareness was achieved by naming 3 knowledge leaders and assigning them responsibility for KM actions. Relating the KM programme to the divisions goals, and having a beginning of a monitoring process for it allowed some points for the methodical level (higher than company's average): 1.15



1.2 Capturing and documenting knowledge (2003)

The division stated having prepared a plan to capture knowledge from the other divisions in order to transform it into training modules, to eventually become the basis of the content management system the division established latter (lower than company's average): 0.5



1.3 Retrieving knowledge for reuse (2003)

Retrieving for reuse was found in one of the departments and though it wasn't performed in a methodical way and across the division, it still demonstrates some awareness (lower than company's average): 0.5 ↓

1.4 Creating knowledge (2003)

Attention to new knowledge created when generating new training modules and documenting them adequately was discerned in some cases (lower than company's average): 0.3 ↓

1.5 Sharing knowledge (2003)

The division IAI-Net site is mainly of informative nature but was lately added with a list of available courses following demand from employees across the company (lower than company's average): 0.3 ↓

2 Objectivity – mutual over self assessment (2003)

The author is considering an objectivity factor of between 0.8 and 1.2 as sign of reality for the division assessing its own performance. This is definitely an advantage to whoever is interested in corrective action, as it positions the division in a closer position to where it should be. The objectivity factor, calculated to be 1.13, shows they were a little bit too modest in their self assessment. ↓

3 Self and Mutual assessment grade (2004)

U graded itself higher than in 2003 at 0.6 (still quite modestly). The mutual assessment grade was 0.7 divided as follows: ↑

3.1 Managing and tracking of the programme (2004)

No evidence was found to the relation between the KM programme and the division's goals, so the grade went back to the awareness stage: 1 (higher than company's average). ↑

3.2 Capturing and documenting knowledge (2004)

No evidence was found to the actual gathering and capturing of knowledge as stated in 2003. The number of debriefings conducted was too small to generate a sizable list of lessons learned: 0.5 (lower than company's average). ↓

3.3 Retrieving knowledge for reuse (2004)

There was no activity on competence centres, yet in each directorate there is a database of previous price proposals used for the generation of new ones: 0.33 (lowest in the company). ↓

3.4 Creating knowledge (2004)

New knowledge created in training programmes is transferred to all programme managers in monthly meetings: 1 (higher than company's average). ↑

3.5 Sharing knowledge (2004)

U participation in communities of practice is still stagnant: 0.67 (lower than company's average) ↓

4 Objectivity – mutual over self assessment (2004)

The objectivity factor, calculated to be 1.17, shows U improved their self assessing capability to a point just within the realistic range. ↑

17.8 Pattern of performance

	Success Parameter		U		Improvement		Pattern
			2003	2004	Av.	Lead/lag	
PDM	Number of KM procedures		7	4			↓
	Number of measures		7	4			↓
		Performance	6	3			↓
		Throughput	1	1			
		Business result	-	-			
	Achievement of goals		25%	50%			↑
	Number of actions		7	4			↓
	Follow up on actions		-	-			↓
	KM programme participation		6	4			↓
M/A	Mutual assessment grade		0.54	0.7	2.11	61%	↓
		Managing and tracking of the programme	1.15	1	1.73	50%	↓
		Capturing knowledge	0.5	0.5	1.41	71%	↓
		Retrieving knowledge for reuse	0.5	0.33	1.02	65%	↓
		Creating knowledge	0.3	1	1.47	227%	↑
		Sharing knowledge	0.3	0.67	1.36	164%	↑

Table 17-4: Division U - Pattern of performance

From the pattern of performance of the U division, one can see no improvement of performance with regard to the PDM measures though there is 1 throughput measure both in 2003 and in 2004. None of the actions are managed, and even the participation has decreased. Moreover, achievements of goals have improved but are still at 50%.

The M/A section of the pattern of performance of the U division also shows a disappointing picture in as much as though there is improvement in the absolute values of the performance of all the components of KM, but half of them are still much lower than the company's average. The overall score improved but is still lagging the company's improvement by 61% - second to the lowest in the company, (the lowest division actually reached in 2004 lower scores than in 2003). Clear improvement was achievement only in the fields of knowledge creation and knowledge sharing.

17.9 Division analysis

U is a division that envisions knowledge as its core product; its part of its logo, and though it is represented by various other terms, it is very clear that it should have been the perfect environment to promote KM (**environment**).

U's improvement between 2003 and 2004 was marginal (130%) and definitely below the average in the company (211%). U's knowledge manager assessed better (1.17) his KM performance in 2004, and with the potential his division

provides him, he is bound to improve even more in 2005. The author will try now to explore the behavioural factors in U, hoping they will constitute at least a background if not a rationale to these results.

The position of the U knowledge manager on the hierarchical management ladder is such that it should be easy for him to establish a knowledge management organization and to get approval for the appointment of knowledge leaders across the division (**profile**).



U's GM is a natural supporter of KM and he shows it openly (**management support**). Both him and the knowledge manager, have a positive attitude to **long term values**. Beyond this being a favourable background to the development of KM in general, it would suggest a tendency to increase the creation of new knowledge. This hasn't been demonstrated in U.



U's knowledge manager didn't choose throughput or business results measures in both years. This is a sign of lack of initiative on his part though there is a recommendation of using them, and though he stated his belief in having to show tangible results to his GM (as a return on investment) (**quality of performance**).



The knowledge manager didn't use the leverage of the natural **relevance**¹ KM has to U's performance. The result was that both in 2003 and in 2004 his achievements of goals were less than positive (though 2004 showed improvement as compared to the previous year).

U's knowledge manager distributed tasks among the knowledge leaders appointed yet achieved only a few of his goals in 2003. He was using KM to leverage his main interest, which is e-learning (as it can be seen from his choice of measures) (**profile**). In 2004 he started to use a little more the KM handbook, and the result shows in the 2004 assessment which was a little better (**quality of performance**). He also took the **initiative** of publishing a directory of experts about widely used software packages in the company.



¹ The definition of perception of relevance to division performance was 'activity or quality recognised to enable concrete and short term benefits for the division and treated accordingly', and in the case of U were knowledge is so strongly incrustated in its activity, it seemed as a perfect leverage to enable the implementation of KM.