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On Smart and Natural Language Technology Support of Strategy Work

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HELSINKI UNIVERSITY OF TECHNOLOGY
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Abstract

This research explores how natural language processing of text, which is in electronic format, might be exploited to benefit strategic business planning in companies. It entails considering devices for making sense of huge, complex and dynamic data for decision making in a complex and dynamic world. It entails grasping managers' true requirements.

Text that is in electronic format abounds. The Internet is continuing its phenomenal growth. Strategic decision-makers in companies struggle with making sense, keeping up with and taking advantage of the emerging world.

Theoretical and technological advances in many fields of inquiry, from strategy to information technology, give rise to new promises for computer support of strategic managerial work. Management of knowledge and computer processing of natural language format text are among these.

After surveying the field of strategy for its requirements and the state of art some alternative solutions are considered. A partial solution that was actually built is described together with experiments performed with it. Feedback solicited and obtained from managers with help of the concrete existence of the partial solution is then examined and analysed thoroughly.

Ideas related to the use of systems based on language and knowledge technology have been developed and many issues identified. This together with managerial feedback forms a base for creating strategy support systems in the future.

Keywords: Strategy support, decision support, business intelligence, competitive intelligence, content analysis, knowledge management, language technology.

Preface

Over the years I have held both line and staff management and executive positions in companies in the IT industry in Finland and abroad. The companies have included IBM, Dava (then part of the Ericsson camp), Olivetti, Nokia Data and ICL. Whilst being in charge of business development and the strategy processes I became interested in the use and development of computer based tools to support business planning. This, briefly, is the path that has lead to the present research. The path has created not only an interest in the subject of this dissertation but hopefully also some practical insights concerning the field. During my forty years in the IT industry I have made or been part of many decisions, or non-decisions, some of them known, and some not known to be of strategic nature, and I have seen the results. In addition I have observed many others make or not make decisions and seen the results.

By basic training I am an electronics and control engineer. As with so many of my fellow students my early professional work, however, was in programming and information systems engineering. I suggest that I still have a basic understanding of matters technical.

In this work I have resorted to my experience in strategic business planning. I have tried to combine it with my technical background to cover the ground of the domain rather comprehensively. I have tried to show to the would-be developer of strategy support tools what a multi-faceted domain business strategy is and I have tried to demonstrate to the business manager what opportunities new technologies might open. Hence the volume of this thesis. Yet, I have only scratched the surface.

The picture on the cover page intends to illuminate an aspect this research has aimed at. It is a stereogram, a picture in three dimensions. On the surface of it one can see clear looking patterns, perhaps hard to fully untangle but business as usual, you would think. However, if you manage to take an uncustomary focus and look deep into the picture - in fact focus on something beyond the surface of the picture - you will see a rotor lurking. It is these rotors we want to detect.

Acknowledgements

I want to thank my supervisor, Professor Eero Eloranta, very much for his advice, for forcing me to ask the critical questions and for showing how to steer the course to answer them. The emergence of this thesis is proof of his supervisory skills. I am sorry to have exceeded the number of pages goal.

Professor Jukka Ranta was my supervisor before Eero. Without his sustained belief in that my work will eventually give results this thesis would not have materialised.

I owe my two external pre-examiners, Professors Christer Carlsson from Åbo Akademi and John Sillince from Aston University, U.K., special thanks for taking the effort to peruse the manuscripts, for providing valuable guidance leading to value-adding efforts, and for demanding the deletion, completion and tie-up of loose threads. I appreciated highly their "due diligence" process.

Professor David Hawk, from the New Jersey Institute of Technology, asked penetrating questions about my work for which I am grateful. Professors Kimmo Koskenniemi and Lauri Carlson, from the University of Helsinki gave valuable advice on language processing aspects. Dr Roman Yangarber from the New York University was very helpful and a valuable discussion partner in matters regarding Information Extraction.

Professors Eila Järvenpää, Tomi Laamanen and Markku Syrjänen and Dr Seppo Törmä reviewed versions of the manuscripts of this thesis. Thank you for the effort, the comments and the constructive criticism.

I want to thank Jussi Kanerva, the director of the TAI Research Center, for creating a straightforward, well-functioning place to work in. I am also grateful to Professor Shosta Sulonen who helped me to get started and introduced me to TAI.

I wish to thank Tekes and the participating companies - Aspocomp Group, Fortum Service, Metra Group, Partek, Rautaruukki, Sanoma - WSOY and Sonera for financing the projects that have made this dissertation possible. Further thanks go to the Tekes representatives, Dr Eero Silvennoinen, Henri Grundsten, Kari Salo, Matti Sihto and Marko Heikkinen for their support of the projects. The experienced and learned company representatives, Dr Jyrki Ahola, Heikki Allonen, Sami Holopainen, Pertti Huhtala, Dr Markus Kajanto, Dr Mikko Kosonen, Simo Makkonen, Kimmo Myllymäki, Perttu Pitkänen, Dr Erkki Räsänen, Tommi Tikka and Mikko Vuorikoski who served in the Steering Groups at one time or another provided valuable input, guidance and help for the projects. My special thanks go to Heikki Äyväri of Sonera who stayed on board and supported all phases of the projects. I also thank the many managers who gave me the chance to interview them for gaining management feed-back.

I am grateful to my fellows at Exima, - Lasse, Heikki, Sami, Teppo, and others - with whom I have had the chance to show and discuss my work.

I am especially thankful for the efforts of the researchers and students who have worked in my projects. Dr Seppo Törmä worked earlier on on ontology, Jussi Piitulainen and Sirke Viitanen, from the University of Helsinki, on the linguistic aspects, and Ilkka Karanta, Paula Silvonen and Kuldar Taveter, from VTT, on the knowledge aspects. Samu Eränen, Vesa Niininen, Juha Risikko, Mika Säkkinen and Kari Virtanen did field surveying. Lauri Seitsonen worked in addition to the modelling, relevance evaluation and information extraction aspects also as the chief designer and system integrator. I especially commend Lauri for his self-initiative, helpfulness, exceptional productivity, and for the high quality of his programming. If I had to depend on a piece of software for something very critical I would be scared, to be honest, but significantly less so if I knew Lauri had written it.

I thank Dr Pasi Tapanainen and Conexor Oy for fruitful and flexible cooperation.

I want to thank my mother, Hellin Keijola, for her ever-present warm sympathy and for the role model of an active mind and spirit that she and my late farther have been to me. I want to thank my family at large for their interest in my work. I wish this work would encourage my grandsons, Artturi and Julius, and others in the family, to consider the joys of academic inquiry. My brother-in-law, Andy, I must thank for persistently querying about the status of my work.

Finally, my warmest thanks go to my most important, and critical, success factor, my dear wife, Kaija. Her unfailing support has been a great and necessary encouragement. Her firm and sustained belief in my intellectual capacity never ceases to take me by surprise. I want to express my deep gratitude and affection.

Nurmijärvi
21.2.2003

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List of Abbreviations and Acronyms

Abbreviation	Term
ASP	Application Service Provider
BI	Business Intelligence
BKB	BRIEFS Knowledge Base
BSC	Balanced Score Card
BPTT	Business Plans That Think
BRIEFS	BRief driven Information retrieval and Extraction For Strategy
BU	Business Unit
CD	Compact Disk
CEO	Chief Executive Officer
cg	constraint grammar (parser)
CI	Competitive Intelligence
CPSL	Common Pattern Specification Language
CRM	Customer Relationship Management
DARPA	Defense Advanced Research Project Agency (U.S.A.)
DB	DataBase
DSS	Decision Support System
DVD	Digital Video Disk
EDGAR	Electronic Data Gathering Archive (SEC)
EIS	Executive Information system
fdg	functional dependency grammar (parser)
ICT	Information and Communication Technology
IE	Information Extraction
IP	Internet Protocol
IPO	Initial Public Offering
IPR	Intellectual Property Rights
IS	Information System
ISP	Internet Service Provider
IT	Information Technology
KB	Knowledge Base

Abbreviation	Term
KM	Knowledge Management
MIS	Management Information System
MUC	Message Understanding Conference
NAICS	North American Industry Coding System
NASA	National Aeronautical and Space Agency (U.S.A.)
NewsML	News Markup Language
NRMV	Normalised Relational Metric Value
NTNRMV	Normalised Total Normalised Relational Metric Value
NYSE	New York Stock Exchange
PIMS	Profit Impact of Marketing Strategy
POS	Part of Speech
RMV	Relational Metric Value
RRV	Relevance Ranking Value
SBU	Strategic Business Unit
SEC	Securities and Exchange Commission (U.S.A.)
SGML	Structured Graphical Markup Language
SIC	Standard Industry Code
SQL	Structured Query Language
SW	Semantic Web
SWOT	Strengths, Weaknesses, Opportunities and Threats
TE	Template Element
TIPSTER	Not an acronym, a DARPA program for processing text
TNRMV	Total Normalised Relational Metric Value
TR	Template (Element) Relation
URL	Universal Resource Locator
VAR	Value Added Reseller
WAP	Wireless Application Protocol
WFB	World Fact Book (CIA)
XML	Extensible Markup Language

1 Introduction

1.1 General Research Interest

Our life as human beings on our planet is increasingly becoming independent of the physical environment around us. We are reasonably sheltered of the weather, we have light 24 hours a day, should we wish, we can easily hop from one end of the world to the other and so on. On the other hand at the same time we are becoming increasingly dependent on the virtual world we are busily creating. The creation and maintenance of this New World is largely based on data or information. It presents new challenges for individuals and organisations and calls for new types of methods and tools.

There is an avalanche of data in electronic digital format, including text, and there is no stopping in sight. This avalanche hits most people in the networked society. The management and utilisation of all data and information being created today has become a huge problem and at the same time it presents new opportunities. On a global scale the problems are gigantic but one could perhaps think that by focusing on a narrow topic, such as "management", one could limit the number of books. As an example, however, Amazon.com, the electronic bookstore, gives 32 000 titles in response to search on books about "management". In the year 1999 alone 5513 new books on "management" were published. In the year 2001 similar numbers (5327) were observed[1].

Lyman and Varian (2000) provide estimates about how much information is produced in the world each year. They calculate that in 1999 the world's total yearly production of print, film, optical, and magnetic content would require roughly 1.5 exabyte of storage (an exabyte is a billion gigabytes or 10^{18} bytes). This is 250 megabytes for every man, woman and child on earth and it may be increasing at a rate of 50% annually. The majority of this content is on magnetic media. Paper media only accounts for .003 percent of the total storage of information. Table 1-1 and Table 1-2 summarise their results.

[1] www.amazon.com. Accessed in March 2000 and December 2001. Note that the search term "management" is broad.

Table 1-1 Worldwide production of original content, stored digitally using standard medium, (Lyman and Varian (2000))

Storage Medium	Type of Content	Terabytes/year Upper Estimate	Terabytes/year Lower Estimate	Growth rate, %
Paper	Books	8	1	2
	Newspapers	25	2	-2
	Periodicals	12	1	2
	Office documents	195	19	2
	Subtotal:	240	23	2
Film	Photographs	410,000	41,000	5
	Cinema	16	16	3
	X-Rays	17,200	17,200	2
	Subtotal:	427,216	58,216	4
Optical	Music CDs	58	6	3
	Data CDs	3	3	2
	DVDs	22	22	100
	Subtotal:	83	31	70
Magnetic	Camcorder Tape	300,000	300,000	5
	PC Disk Drives	766,000	7,660	100
	Departmental Servers	460,000	161,000	100
	Enterprise Servers	167,000	108,550	100
	Subtotal:	1,693,000	577,210	55
	TOTAL:	**2,120,539**	**635,480**	**50**

Table 1-2 Yearly production of published information, (Lyman and Varian (2000))

Item	Titles	Terabytes
Books	968,735	8
Newspapers	22,643	25
Journals	40,000	2
Magazines	80,000	10
Newsletters	40,000	.2
Office Documents	7,500,000,000	195
Cinema	4,000	16
Music CDs	90,000	6
Data CDs	1,000	3
DVD-video	5,000	22
Total		**285**

The public part of the World Wide Web, the "surface web", was estimated to consist of 2.5 billion documents in the year 2000 (Lyman and Varian (2000)). The textual content on the pages amounts to some 10 to 20 terabytes. There are estimates which state that more than 7 million new pages are added each day[2], and the rate is increasing. The multilingual nature of the Web is also increasing, the number of multilingual websites is growing at a tenfold rate (ibid.). If all web-accessible information such as web-connected databases, dynamic pages, Intranet sites, etc, i.e. the "deep web", is taken into account then the size of the Web is estimated at 550 billion web-connected documents. According to Lyman and Varian (2000) between 610 to 1100 billion e-mail messages with an average length of 18500 bytes were sent in the year 2000. The popular search engine, Google, at the time of this writing claims to search 3,083,324,652 web pages[3].

Data and text that is available in electronic format is thus increasing at a rapid rate. The increase will be sustained for some time to come as the Web and ways to access it spread and as technologies for new ways of inputting data evolve. For instance and

[2] Antonio Sanfilippo from the European Commission at Computational Linguistics Conference 2000 in Saarbrucken on Aug, 3, 2000.

[3] Google, www.google.com , accessed in November 14, 2002.

perhaps most notably, speech recognition will one day mature. This will enable automated conversion of speech to text some time in the future

The development outlined above leads one to the thought that if it were possible for a computer to better "understand" electronic text and to turn it in some computable format this would bring benefits both to individuals and organisations. Information would become more manageable. New knowledge represented by the information could be discovered and would become available easier. This could benefit many areas of human endeavour, for example the domain of strategic business planning which is our particular area of interest.

Textbooks about the ways and means of planning and managing business strategies abound. They are littered with stories of successes and failures of the approaches and the decisions companies have taken (e.g. Porter (1980), (1985), Mintzberg et al (1996), Kay (1993)). Information about the successful use of computer tools or information systems supporting strategic decision-making is lacking, however. Either these tools do not exist or they are not used. The term S*trategic information system* in most cases implies something rather operational (see e.g. Turban (1999)). These systems may be of strategic importance, but they do not directly support strategic decision-making.

Research and practical development is progressing in many areas that may touch on strategic management or may have implications in it. These areas include in addition to the field of strategic management proper, advances in computer technology, computational linguistics, artificial intelligence, content analysis, business intelligence, knowledge management etc. At the moment, however, these advances are fragmented. Integrated support systems do not seem to exist.

This study intends to contribute to the inquiry into the creation of meaningful support for decision making especially at the level of corporate and business strategy. The requirements for supporting systems will be examined and possible innovative solutions together with conditions for their adoption will be considered. One avenue for contributing in creating support is particularly explored. That avenue is based on

exploiting qualitative data that is electronically available in natural language textual format.

1.2 Scope of the Thesis

This thesis results from work performed in two research projects. During 1997 and 1998 we conducted a research project called Business Plans That Think (BPTT) (Keijola (1999)). The principal idea then was to conceive of a system that would support creation of computer models of a business from the strategic point of view. These models were to have the ability to follow up the development in the business and in its environment and to be intelligent enough at least to alert the business planner of problems and opportunities with the strategy in the light of the observations. This project created many insights into the issues involved in creating support for strategic planning.

In creating and using computer-based models of the strategic aspects of businesses we first need to create the model itself and then we must feed the model with observations about the real world. The model should reflect both the business and its environment. It should be based on some sound theory of business strategy. The theories are based on some high level mental constructs such as "value proposition", "distinctive value chain", "bargaining power" etc. (e.g. Porter (2000)). These constructs are hard to model and the world keeps on changing relentlessly, new constructs get born, existing ones get new definitions, and old die. To measure and make observations about the constructs and their inter-relationships is not straightforward either. Yet the current models usually require the user to express the values of these variables in a numeric format. In practise that often means that a group of users builds some consensus view of the evaluation of the business and its competitors with regard to the variables. This process is fraught with unsystematic and inconsistent practices and even corporate politics. Forms might be used to assist in the process but forms restrict expression. Coding is needed but coding may loose information and often does not encourage multiple views. Productivity is not good. All information does not receive attention. Work to alleviate some of these issues and to improve on strategic decision making has been going on as described e.g. by Eden and Ackerman (1998). What is ideally needed, however, is a method of analysing

basic level qualitative business data and converting the information as rigorously and as consistently as possible to a format required by the models.

The BPTT project lead us to consider whether natural language text processing may have a role to play in creating support for strategic business planning. This was the focus of our second project called Brief Driven Information Retrieval and Extraction for Strategy (BRIEFS) run from 2000 to 2002 (Keijola (2002)). In this research project we have primarily been interested in the exploitation of electronic textual data in support of (strategic) business planning. Textual data here includes text documents and other text format communication, including electronic mail, related to a business or its environment. We assume that natural language textual format is a key and flexible means for documenting information about the intents and plans of a business as well as for information concerning the environment in which the business operates in. And documentation is always important. As Weick (1995) puts it: "How do I know what I think unless I see what I say".

1.3 The Research Questions and Further Scoping

In this research, we intend to provide some answers to questions regarding computer support for strategic business planning and the potential role computer processing of natural language format text may play in it. Within the research frame we intend to give answers to the following questions:

1. What kind of computer based tools exist to support strategy work?
2. Are the tools used?
3. Is there a need for the tools?
4. What are the requirements for the tools?
5. What could be the solutions for the tools?
6. Could partial and useful solutions be built?
7. What does management think about the partial solutions built and why?

The numbering above does not imply importance, rather it implies a sequence. We could have put the research questions in another order: we could have started with the need question. We felt, however, that by starting with the existence and the use questions we can gain a better and realistic background for answering the need

question. Additionally, the order of the first three questions is perhaps not of crucial importance. The questions are not orthogonal. They are intertwined and in practice we need to answer them in an iterative way. We elaborate on the research questions in Section 2.2.

Strategic business planning, including "*strategy work*", here refers to the identification, planning and follow-up of issues and decisions that have a long term business impact rather than short term operational effects. This entails making sense of the business environment, recognising longer-term opportunities and threats, setting direction and objectives for the future, and defining policies and selecting courses of action. It involves data gathering, modelling, interpretation and decision-making.

It is acknowledged that communication is an essential part of the processes involved in strategy work and the facilitation of it is an important consideration. In this research our emphasis, however, is on the creation of content for strategic planning and not the direct facilitation of its processes.

It is acknowledged that important coded information about business exists and is communicated in formats other than text, such as accounting reports, e.g. based on International Accounting Standards, as well as pictures, videos and slide presentations but the analyses of these are not within the scope of this research. Further, we touch on but do not explicitly explore the domain of acquiring raw text, e.g. searching the Internet for data with the help of agents. Here we assume that a sufficiently rich set of data can be obtained with the help of existing means of search and supply. Finally, we acknowledge that some important information may be not coded at all, is tacit.

This research touches on a number of disciplines from the high levels of strategy to the detailed linguistic analysis of text. The intent is not to strive for technical excellence or major new insights in any single of them. Rather, the intent of this study is to bring them together to bear on the promise of computer based support for the work of the business strategist. Thus this research is of necessity broad but shallow rather than focused and deep. We feel a broad picture is warranted here as current research seems to be fragmented and ignores integration. Whilst in many ways this

research is technical in nature we will give emphasis to gain an understanding of what managers in the end think about the potential tools and why.

Two caveats need to be registered. The first is that we will report on the exploitation of some tools that were developed to find answers to the research questions. The goodness of the tools for us is measured in how well they highlight the issues involved rather than how well they solve a practical problem. The technologies are maturing but, in our view, not mature, yet. The second caveat is that the ways and means to represent, discover and, utilise information and knowledge are currently receiving enormous attention. This is evidenced e.g. by the rapidly spreading appearance of "knowledge portals", tools for business and competitive intelligence and the activities around "the Semantic Web" (Berners-Lee et al. (2001)). We are dealing with a phenomenon that no single man can fully fathom or trace. It is, therefore, not our intention to attempt to fully cover the field but to try to project and explore some ambitious goals that might one day be achievable. Our main interest is to outline a framework and experiment with some aspects of it, and in this process to produce some contributions to the theory of computer support for strategic management.

1.4 Contents of This Thesis

This thesis is structured as follows. We begin by elaborating on the research questions and by discussing the research methodology in Chapter 2, "Research Questions and Methodology". We then provide some justification for this research in Chapter 3, "The Practical Relevance of This Study", by showing, that companies' current deployment of computer based tools in strategy work is limited. In essence we give first answers to research questions one to three, "What kind of computer based tools exist to support strategy work?", "Are the tools used?", and "Is there a need for the tools?" Subsequently, in Chapter 4, "Description of the Strategy Domain and Its Requirements", we address the research question four, "What are the requirements for the tools", by describing the domain of interest as well as some related or supporting domains dealing with information and knowledge. We show what an all-encompassing and many-faceted field strategy is and arrive at some key requirements. In Chapter 5, "A Review of Tools, Techniques and Technologies", we return to the "What kind of computer based tools exist to support strategy work?" question and

provide more answers to it. We review a large number of tools and techniques. In Chapter 6, "Theoretical Considerations", we give answers to question number five, regarding possible solutions, by developing some theory. We describe the construction we built in Chapter 7, "The BRIEFS System". In Chapter 8, "The Experiments", we discuss the experiments we have conducted and provide more answers to question six with the emphasis being on "useful". In Chapter 9, "Management Feedback", we give answers to research question seven, and more answers to questions two, three, and four by making use of the results of the feedback obtained from management. We have deferred many evaluative discussions to Chapter 10, "Evaluations" which presents a collected evaluation of our results. It also answers the "why"-part of question seven. It addresses the reasons for the managers' feedback by examining the feedback based on the theory of innovation diffusion. Conditions for the adoption of an innovation are explored. Chapter 11, "Conclusions", presents the conclusions of this study.

The structure of this thesis and where the research questions are answered is summarised in Table 1-3.

Table 1-3 Chapters of this thesis and their relation to the research questions

	Research Question						
Chapter	1. What kind of tools exist?	2. Are they used?	3. Is there a need?	4. What are the rquirements	5. What could be the solutions?	6. Could useful solutions be built?	7.What feedback does management give and why?
3. Practical Relevance of This Study	Y	Y	Y				
4. A Description of Strategy…				Y			
5. A Review of the Tools for Strategy	Y				Y		
6. Theoretical Considerations					Y		
7. The BRIEFS System					Y	Y	
8. The Experiments						Y	
9. Management Feedback	Y	Y	Y	Y			Y
10. Evaluations				Y		Y	Y
11. Conclusions	Y	Y	Y	Y	Y	Y	Y

The body of this thesis is rather lengthy. Resorting to the use of appendices could have shortened it. It was felt, however, that it could possibly have increased the total number of pages and would not necessarily have made the thesis any more readable.

Numerous references are made to Keijola (1999), "Augmenting Business Planning", which presents the results of some early work related to this research.

2 Research Questions and Methodology

1. **What kind of computer based tools exist to support strategy work?**
2. **Are the tools used?**
3. **Is there a need for the tools?**
4. **What are the requirements for the tools?**
5. **What could be the solutions for the tools?**
6. **Could partial and useful solutions be built?**
7. **What does management think about the partial solutions built and why?**

We shall repeat our research questions at the head of each chapter as shown above. The questions shown in bolded font will be dealt with in the then current chapter.

2.1 Introduction

This chapter elaborates on the research questions posed, discusses the options for methodological approaches and the choices made in this study.

2.2 Elaboration of the Research Questions

The motivation of our research questions and the objectives for the expected answers are the following

1. What kind of computer based tools exist to support strategy work?

   The objective for the study of existing tools is to learn about their functionality and limitations. We are looking to motivate the need for this research. We are looking for requirements for better tools.

2. Are the tools used?

   The objective of this question is to ascertain the usefulness of the existing tools. For example, wide use could indicate useful tools, low use inadequate or hard to use tools.

3. Is there a need for the tools?

   The answers to the first two questions may imply an answer to this question, too. The objective for the answers to this question, however, is to establish that regardless of the answers to the first two questions there is a need for tools.

4. What are the requirements for the tools?

   The answers to this question would constitute necessary requirements for future support systems.

5. What could be the solutions for the tools?

   The answers to this question describe what alternative options exist.

6. Could partial and useful solutions be built?

   The objective is to show that useful systems can be built, can be experimented with, and can produce results that may be useful in strategy work.

7. What does management think about the partial solutions built and why?

   The objective is to assess the utility of the solutions built and to establish requirements for future systems. This is particularly important as we are dealing with a nascent field. It is advisable to well understand what potential users think. A second objective is to dig deeper and understand why managers do think as they have and to understand all the conditions for the adoption of the envisaged ideas and systems.

2.3 Methodology

What kind of approaches and methods do we employ to accomplish our tasks and to find answers to the research questions we have posed? To find creditable answers to the research questions we need to

- gain an understanding of the strategy domain and its tools
- gain an understanding about the current tools practises in companies
- find an acceptable and useful theoretical framework for the tools
- conceive, design and build solutions for tools
- experiment with the solutions
- verify the validity of the solutions, i.e. show that they are correct in terms of theory and practice

We need to survey. We need to construct. We need to validate. We need to find out what potential exploiters think. In this section we will discuss the methodological choices we have made and the research techniques we have used.

Let us start by discussing the options and the decisions we have made based on the main dimensions for research found in the literature. The following discussion is based on a combination of the following sources: Guba and Lincoln (1994), Kasanen et al (1993), Nunamaker et al (1991), March and Smith (1995). We first consider the basic characterisation according to some dichotomies addressed in the literature. This is followed by a discussion of some methods deemed relevant in our context.

2.3.1 Basic - Applied Research

Our research aims at eventually providing practical assistance to strategic decision making in an organisation. We do not primarily aim to develop and test theories and hypotheses in response to the intellectual interests of the researcher. Applied is thus the right attribute for this work (Nunamaker et al (1991)).

2.3.2 Scientific - Engineering Research

Our research is both scientific and engineering. We hope to gain insight and give answers that are grounded in some practical experience. In our early reviews of literature and the then current research we could not find a research vehicle that would have been available for us to experiment with. We therefore ended up in developing

one of our own. In this sense, that we are creating something that will work, our research is engineering. However, our target of research is not a better mousetrap and its features as such. Rather, our target is the new ways and means of conducting business planning that might be opened up with new types of tools. In this sense our primary research is scientific (Nunamaker et al (1991)). We strive to (i) gain a better understanding, more insight; (ii) gain new experience not yet derived from existing theory and (iii) find new theory by falsifying existing theory and/or building on new experience.

2.3.3 Evaluative - Developmental Research

Developmental type of research involves the search for instructions that yield a better course of action. (Nunamaker et al (1991)) Our research has thus a strong developmental drive.

2.3.4 Formulative - Verificational Research

The goal of formulative research (also called exploratory research) is to identify problems for more precise investigation, to develop hypotheses, as well as to gain insights and to increase familiarity with the problem area. The goal of verification research is to obtain evidence to support or refute formulated hypotheses (Nunamaker et al (1991)). In this respect our research is formulative (exploratory).

2.3.5 Theoretical - Empirical Research

Our intent is to study the possibility and the utility of tools for the exploitation of a particular type of data (text) in a particular domain (business planning). As practical implementations of such tools do not exist we also need to develop some constructions with which we can test at least parts of the theory and through which we better understand the issues involved. Further, we will submit the constructions to practical tests. In this respect, then, our research is empirical (Kasanen et al (1993)).

2.3.6 Quantitative - Qualitative Research

Our domain of interest, deep down, is the support of observation and assessment of the behaviour of a class of social systems, the systems of business. The goodness for the support surfaces as reactions of managers. These offer few natural quantitative measures. In this respect part of our research is necessarily qualitative rather than quantitative.

2.3.7 Descriptive - Normative Research

The eventual objective for the results of this research is to lead towards helping managers of business make better decisions. In this sense, assuming our results can be validated, our research could be considered normative rather than descriptive (Kasanen et al, (1993)).

2.3.8 Positivism - Postpositivism - Critical Theory - Constructivism

The human being is not the prime object of our study although text is mostly the result of human efforts, at least for the time being. It is nevertheless interesting to classify this research as following either the positivist, postpositivist, critical theory or constuctivist research paradigm. The basic beliefs in these alternative paradigms are summarised by Guba and Lincoln (1994) as shown in Table 2-1.

Table 2-1 Basic beliefs (metaphysics) of alternative inquiry paradigms, (Guba and Lincoln (1994))

Item	Positivism	Postpositivism	Critical Theory et al	Construct-ivism
Ontology	Naïve realism - "real" reality but apprehendable	critical realism - "real" reality but only imperfectly and probabilistic-ally apprehendable	historical realism - virtual reality shaped by social, political, cultural, economic, ethnic, and gender values; crystallised over time	relativism -local and specific constructed realities
Epistemology	Dualist / objectivist; findings true	modified dualist/ objectivist; critical tradition/ community; findings probably true	transactional/ subjectivist; value-mediated findings	transactional/ subjectivist; created findings
Methodology	Experimental/ manipulative; verification of hypotheses; chiefly quantitative methods	modified experimental/ manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods	dialogic / dialectical	hermeneutic/ dialectical

Guba and Lincoln (1994) pose three questions, the answers to which help characterise the paradigms. We answer them in the following based on the basic beliefs behind our

research. We answer these questions as an investigator of tools rather than as a user of tools. We recognise that the user of our intended tools could answer them differently.

1. *The ontological question.* What is the form and nature of reality and, therefore, what is there that can be known about it?

   We assume that the constructs and the paradigms used by the planners in the domain of business planning are "real". We assume that text (our prime data) itself is real, and that the text contains information about "real" realities (which in themselves can be true or false). Our posture here is that of a positivist.

2. *The epistemological question.* What is the nature of the relationship between the knower or the would-be-knower and what can be known?

   Here we assume no interaction between the investigator and the investigated. Objectivity is the ideal. The findings are real.

3. *The methodological question.* How can the inquirer go about finding out whatever he or she believes can be known?

   Our answer again follows the positivist paradigm: by experimentation and by verification of hypotheses.

In summary, our answers as constructor of tools reflect a positivist positioning. On the other hand, as interpreters of managers' reactions to our construction we are following what amounts to the constructivist paradigm.

2.3.9 Systems Development Research

A prototype information system needed to be developed in the project. As such it would have been warranted to make use of systems development methodology as the prime methodology. Nunamaker et al (1991) show system development as the central activity in an Information Systems (IS) research cycle as depicted in Figure 2-1. The parts that are relevant to our research are shown in *Italics*.

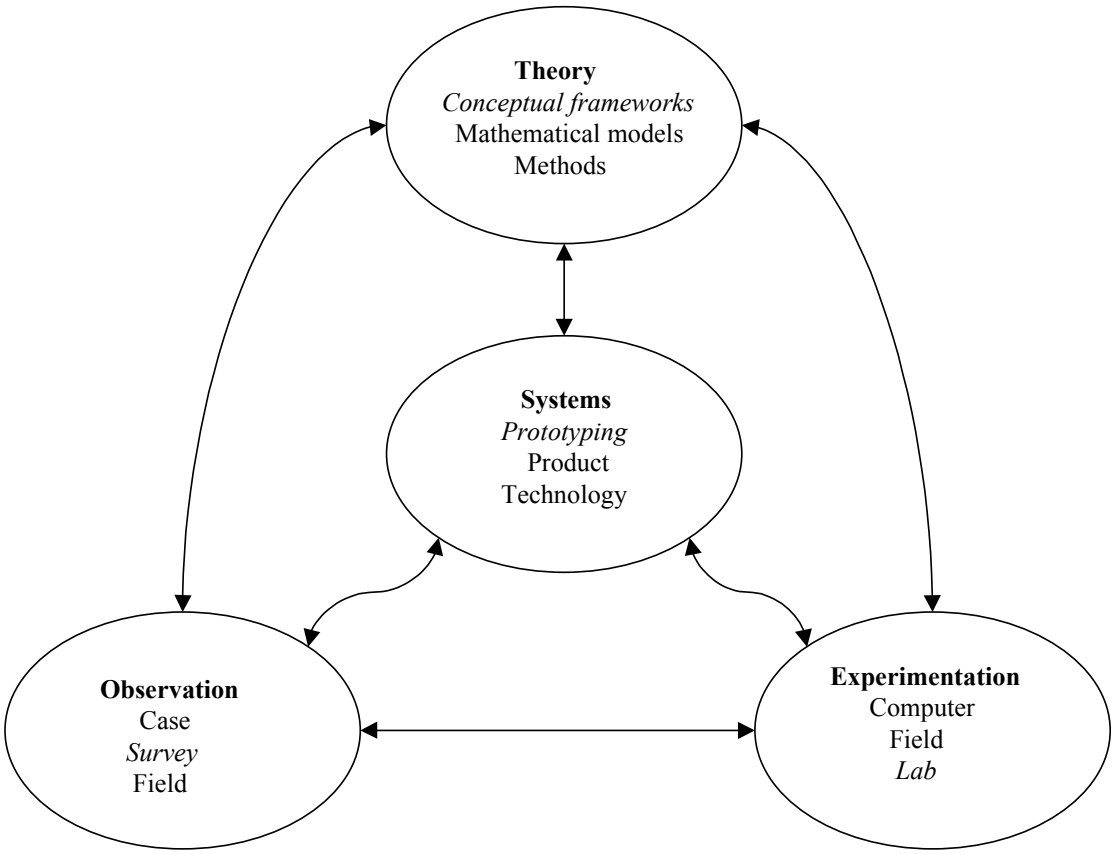


Figure 2-1 A multimethodological approach to IS research, (Nunamaker et al (1991)). The parts that are relevant to our research are shown in *Italics*.

Nunamaker et al (1991) also propose a process for systems development research as depicted in Table 2-2.

Table 2-2 A process for Systems Development Research, (Numaker et al (1991)). Apart from the first phase all phases provide feedback to all previous phases.

Systems Development Research Process	Research Issues
1. Construct a Conceptual Framework	State a meaningful research question Investigate the system functionalities and requirements Understand the system building processes/procedures Study relevant disciplines for new approaches and ideas
2. Develop a System Architecture	Develop a unique architecture design for extensibility, modularity, etc. Define functionality of system components and interrelationships among them
3. Analyse & Design the System	Design a database/knowledge base schema and processes to carry out system functions Develop alternative solutions and choose one solution
4. Build the (Prototype) system	Learn about the concepts, framework, and design through the system building process Gain insight about the problems and choose one solution
5. Observe & Evaluate the System	Observe the use of the system by case studies and field studies Evaluate the system by laboratory experiments or field experiments Develop new theories/models based on the observation and experimentation of the system's usage Consolidate experiences learned

For our purposes Systems Development Research is not the right research approach since our emphasis is not systems development and technical but managerial. We are interested in the uses that the results of a system can be put to in the larger context of strategy. In this respect a more appropriate approach exits. It is the constructive approach (Kasanen et al., (1993)) to be described in the following.

Although we do not regard our research as systems development we generally did follow the process described in Table 2-2 in our construction work with some deviation. For the first, we adopted a special development platform that had been

developed by the University of Sheffield. This platform, GATE, is specially designed for developing experimental applications in Text Engineering, hence its name, GATE, for General Architecture for Text Engineering. Whilst giving many benefits it also posed some restrictions. One did not have to start from scratch but one was confined to what its architecture allowed one to do. For the second, our prime aim was not to do research on systems development but to explore the utility of text processing in business planning. Our main objective for the prototype system(s) was just to gain the desired functionality. Software engineering was not our object of study. Thirdly, we were constrained in our resources. We had a text refinement pipeline in mind and whenever we had to make a decision we favoured the alternative that lead to extending the pipeline rather than the one leading to a more sophisticated solution for a particular function within the pipeline.

2.3.10 Design Science

March and Smith (1995) discuss design science and natural science research on information technology. The distinction between natural science and design science is that whereas natural science tries to understand reality, design science attempts to create things that serve human purposes. Natural science is descriptive and explanatory in intent. Design science offers prescriptions and creates artefacts that embody those prescriptions. The artefacts may in turn give rise to phenomena that can be studied by natural science.

According to March and Smith (1995) the products of design science are of four types: constructs, models, methods and instantiations (implementations). *Constructs* or concepts form the basic vocabulary of the domain. They constitute a conceptualisation used to describe problems within the domain and to specify their solutions. A *model* is a set of propositions or statements expressing relationships among constructs. In design activities, models represent situations as problem and solution statements. A *method* is a set of steps (an algorithm or guideline) used to perform a task. Methods are based on a set of underlying constructs (language) and a representation (model) of the solution space. An *instantiation* is the realisation of an artefact in its environment.

March and Smith (1995) further discuss research activities. Design science consists of two basic activities: build and evaluate which parallel the discovery - justification pair from natural science. *Build* refers to the construction of the artefact, demonstrating that such an artefact can be constructed. *Evaluate* refers to the development of criteria and the assessment of artefact performance against those criteria. The products of design science are assessed against the criteria of value or utility, which ties the evaluation strongly to the environment where the product is intended to be used. Research activities in natural science are to discover and to justify. *Discover*, or more appropriately for IT research, *theorise* refers to the construction of theories that explain how or why something happens. *Justify* refers to theory proving.

March and Smith (1995) conclude in their discussion on design and natural science that both are needed in the research of IT systems. They propose a framework in the form of a four by four matrix along the dimensions of research outputs and research activities as shown in Figure 2-2. This is a model that is useful in explaining what this research is about.

		Research Activities			
		Build	**Evaluate**	**Theorise**	**Justify**
Research Outputs	**Constructs**				
	Model				
	Method				
	Instantiation	**This research**			

Figure 2-2 A research framework (March and Smith (1995))

According to this model our research concentrates on the instantiation-evaluation and instantiation-theorise cells and to some degree to the instantiation-build cell. Individual constructs, models and methods are not the main focus of this research. Whilst we built an instantiation the result of the build as such was not a target for our research. We concentrate on the evaluation of the potential effectiveness of the artefact and its impacts on its intended environment and for its users. Evaluation of efficiency is not of major concern in this research. Theorising will consider

implications and methods for applying the types of instantiated system in business organisations in the future.

2.3.11 The Constructive Approach

A central issue in this research is that we are dealing with "something" that probably does not exist but may be possible and may be needed in the future. To gain an understanding about the true needs we have to somehow make at least some aspects of this "something" concrete so that we can talk about it and evaluate the issues related to it. This made us adopt the *constructive research approach*. Indeed, the choices and the classification discussed in the previous subsections also lead to classifying our research approach as constructive (Kasanen et al., (1993)).

Kasanen et al (1993) define the constructive research approach as a research procedure for producing innovative constructions, intended to solve problems faced in the real world and, by that means, to make a contribution to the theory of the discipline in which it is applied. The central notion of this approach, the (novel) construction, is an abstract notion with great, in fact infinite, number of potential realisations. All human artefacts - such as models, diagrams, plans, organisation structures, commercial products, and information system designs - are constructions. It is characteristic of them that they are invented and developed, not discovered. By developing a construction, something that differs profoundly from anything which existed before, is created: novel constructions bring forth, by definition, new reality.

To position the constructive approach viz. a vis. the other major research approaches Kasanen et al (1993) show the matrix depicted in Figure 2-3. The picture was originally developed with applied accounting research in mind but it is useful in our case, too. The *conceptual approach* produces new knowledge through the method of reasoning. The *nomothetical approach* attempts to find general causal laws through empirical findings. The results of the *decision-oriented, approach,* which also uses the method of deduction, are meant to help management in running the firm. *The action-oriented approach* brings the human in the focus of analysis. The *constructive approach* is normative rather than descriptive and for the most part empirical rather than theoretical.

	Theoretical	Empirical
Descriptive	Conceptual approach	Nomothetical approach Action-oriented
Normative	Decision-oriented approach	Approach Constructive approach

Figure 2-3 The location of the Constructive Approach into the established accounting research approaches, (Kasanen et al (1993))

The constructive research process has the following phases (Kasanen et al (1993)):

1. Find a practically relevant problem which also has research potential.
2. Obtain a general and comprehensive understanding of the topic.
3. Innovate, i.e. construct a solution idea.
4. Demonstrate that the solution works.
5. Show the theoretical connections and the research contribution of the solution concept.
6. Examine the scope and applicability of the solution.

The elements of constructive research are summarised in Figure 2-4

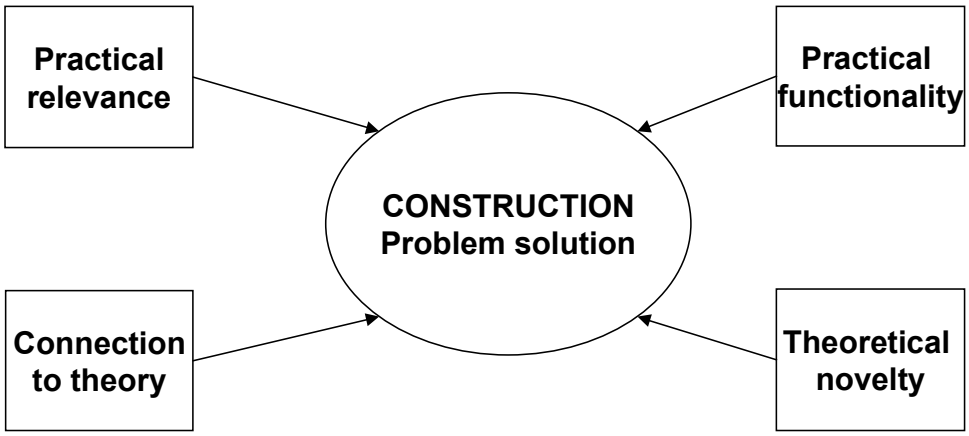


Figure 2-4 Elements of Constructive Research, (Kasanen et al (1993))

In the construction part of our research a vehicle for exploring the possibilities of natural language processing is developed and experimented with. This construction is not intended to be a prototype of a new support system. Rather it is a research instrument. It was conceived to provide the ability to study the issues involved in creating support systems and the benefits that an organisation might gain by using such systems. Our constructive research thus has an exploratory flavour. Emphasis is put on gaining managerial feedback to guide future research.

Table 2-3 shows how answers to the research questions serve to contribute to the different elements of the constructive approach.

Table 2-3 Relations between elements of constructive research and the research questions

Element of Constructive Research	Research Question: 1. What kind of tools exist?	2. Are they used?	3. Is there a need?	4. What are the rquirements	5. What could be the solutions?	6. Could useful solutions be built?	7.What feedback does management give and why?
Practical relevance	Y	Y	Y				Y
Connection to theory	Y			Y	Y		
Construction					Y	Y	
Practical functionality							Y
Theoretical novelty	Y			Y	Y		

2.4 Deployment of Research Techniques and Vehicles

In this research we have deployed a number or research techniques and research vehicles. These have included mailed questionnaire surveys, interviews, creation of architectures and constructions, and experimentation with the constructs. The deployment of the techniques and the research vehicles to answer our research questions is summarised in Table 2-4.

Table 2-4 How research vehicles are deployed to answer the research questions

Research Vehicle	Research Question: 1. What kind of tools exist?	2. Are they used?	3. Is there a need?	4. What are the rquirements	5. What could be the solutions?	6. Could useful solutions be built?	7.What feedback does management give and why?
Survey by questionnaire	Y	Y	Y				
Literature study	Y			Y	Y		
BPTT Architecture					Y	Y	
BRIEFS Construction				Y		Y	Y
BRIEFS Experiments						Y	
Interview	Y	Y	Y	Y		Y	Y

The designs of the experiments will be explained in Section 8.2.

The interviews contribute to the validation of the results. In essence they are intended to provide a "weak market test" as described by Kasanen et al. (1993). In the processing of the results of the interviews for finding out management's feedback and the requirements for strategy support systems our approach is inductive-deductive. In the processing of the results of the interviews for considering the "why?" part of the management feedback question we will make use of the theory on innovation diffusion (Rogers (1995)). The framework will be explained in more detail in Section 10.4.

In the evaluation of the results of our research we also deploy frameworks related to the quality and productivity of information (Lillrank (1997), Dhar & Stein (1997)). We will explain these methods and frameworks in Sections 10.2 and 10.3.

2.5 Factors That Have Influenced This Research

Two factors, which have contributed to and influenced this research, have to be noted. These are the expert groups and the researcher.

2.5.1 The Expert Groups

The primary research that is the basis for this thesis has taken place in externally funded projects. The funding organisations have included the State Technological Research Fund (Tekes) of Finland as the primary funder and some major Finnish industrial companies. The representatives of these funders have formed Steering Committees for the projects. Altogether 19 company representatives and six university professors have served as members of the Steering Committees at one time or another. The representatives of the funders have been directors, managers and specialists responsible for business planning and business intelligence in their respective companies. Their views have guided the direction of the research and in fact provided a relevance evaluation and a weak market test for our constructions (Kasanen (1993)). As a norm the Steering Committees have convened every second or third month. During those meetings new ideas and the most recent developments have been presented and, if possible, demonstrated. The research team has thus at all times

been quite aware of the prospects of the practical relevance of the project to the representative companies. The names of the persons are listed in Appendix 1 The Experts

2.5.2 The Background and the Role of the Researcher

The researcher has over the years worked in several companies, most of them in the IT field. He has worked as a programmer, as a systems analyst, as a manager of programmers and analysts, as a system engineer, as a manager of systems engineers, as a vice president of the systems business of a company, as a founder and managing director of a software company, as a market researcher and founder of a market research operation, and as a vice president of business planning and development. The companies have included IBM, Olivetti, International Data Corporation, Nokia, and ICL. In performing the duties associated in these jobs he has been involved in many decisions and non-decisions, strategic and non-strategic, and seen their strategic consequences. He has over a period of forty years had the opportunity to observe the decision making and achievements of a large number of other people - directors, managers, colleagues, and subordinates - in four countries on three continents.

The roles of the researcher in the projects described in this thesis have been those of a project manager, chief architect, system tester, user, and client liaison.

Despite of the positivist posture of this research the author's personal experience in business planning and management has undoubtedly played a general role in selecting the issues and the road map of this research. The experience may be a "blessing" in that it helps in evaluating the practical issues and the relevance of the research. On the other hand the experience may result in biased views and oversight. The scientific methods employed hopefully alleviate any such bias.

2.6 Summary

In summary our research could be considered design science and our approach is constructive. We explore possibilities for useful computer support for strategy work. Table 2-5 shows where the elements of constructive research are primarily addressed in this thesis.

Table 2-5 Where elements of Constructive Research are addressed

Chapter	Practical relevance	Connection to theory	Construction	Practical functionality	Theoretical novelty
	Element of Constructive Research				
3. Practical Relevance of This Study	Y				
4. A Description of Strategy…		Y			
5. A Review of the Tools for Strategy		Y	Y		
6. Theoretical Considerations		Y	Y		
7. The BRIEFS System			Y		
8. The Experiments				Y	
9. Management Feedback	Y			Y	
10. Evaluations	Y			Y	
11. Conclusions	Y	Y	Y	Y	Y

Finally, it is necessary to note that due to the strongly explorative nature of our research a clear "waterfall" process is not feasible for answering our research questions satisfactorily, rather a more iterative learning process is a practical necessity.

3 The Practical Relevance of This Study

1. **What kind of computer based tools exist to support strategy work?**
2. **Are the tools used?**
3. **Is there a need for the tools?**
4. What are the requirements for the tools?
5. What could be the solutions for the tools?
6. Could partial and useful solutions be built?
7. What does management think about the partial solutions built and why?

3.1 Introduction

In this chapter we briefly develop our first answers to the first three of our research questions. The primary aim here is to establish the practical relevance of this study.

The answers to the questions posed are based on two surveys that were conducted as part of our projects. In the spring of 1997 a survey about the use of business planning tools in major Finnish companies was conducted as part of the BPTT project (Säkkinen and Virtanen (1997)). This study was repeated as part of the BRIEFS project in the fall of 2000 (Niininen (2001)). These studies were conducted in Finland. We assume that the state of art in business planning in Finnish companies is on par internationally. Therefore we assume that similar results would be obtained were a similar study to be conducted in other industrial countries.

3.2 Use and Existence of Tools

As Figure 3-1 depicts the studies showed that the most commonly used computer tools in the strategy process were spreadsheets such as Excel and presentation systems such as PowerPoint. These are very elementary tools in the sense of their intellectual capabilities. However, they pose minimal restrictions and thus allow flexibility in application. Other tools existed but were not commonly used

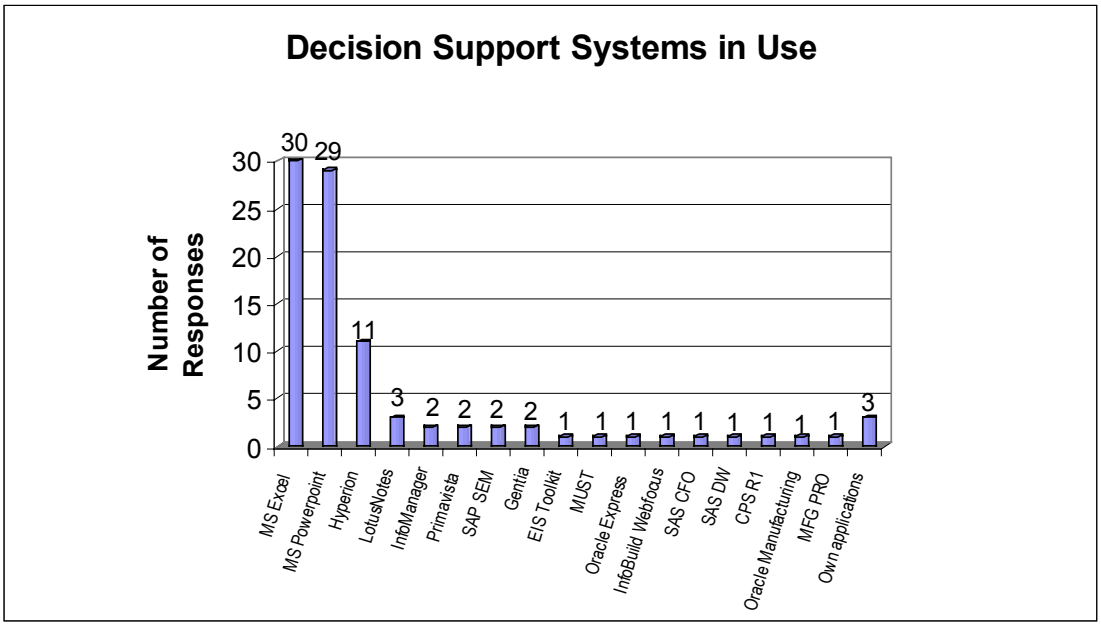


Figure 3-1 Strategic Decision Support Systems in use in major Finnish companies (37 respondents), (Niininen (2001))

3.3 Need for Tools

Whilst a lot of scepticism about the possibilities of computer based tools for strategy work was apparent in the responses to the studies, the respondents felt that the importance of information systems in the strategy process would increase in the future as Figure 3-2 indicates. We interpret this as latent need also for better strategy planning tools. The fact that customer organisations have been willing to participate in funding and supporting our research can also be interpreted as an indication of a need.

Corporate Strategy Board (2000) states that as the business environment becomes faster moving and less predictable, strategists are searching for better ways to collect and analyse information that impacts their strategic priorities. Corporations face three major challenges in this endeavour:

1. Identifying strategically significant market changes
2. Promoting fresh insights about strategic issues
3. Leveraging potential strategic intelligence contributors

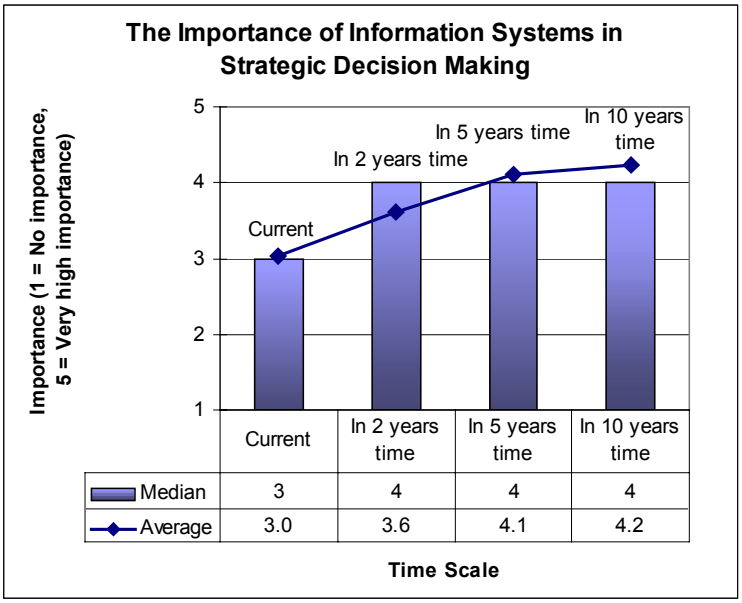


Figure 3-2 The importance of Information Systems in strategic decision making (37 respondents), (Niininen (2001))

3.4 Summary

In answers to our research questions these two surveys indicated that tools exist but only the simplest are widely used. Managers, however, believed that the role of information systems in strategic decision making would increase in importance. We were thus satisfied that our research is relevant and that there is at least a weak need. There is room for improved tools. We will address these questions with more knowledge and in more detail later.

Before going on to considering solutions we must describe the domain of business strategy and review some existing tools and techniques. This is done in the next two chapters.

4 Description of the Strategy Domain and Its Requirements

1. What kind of computer based tools exist to support strategy work?
2. Are the tools used?
3. Is there a need for the tools?
4. **What are the requirements for the tools?**
5. What could be the solutions for the tools?
6. Could partial and useful solutions be built?
7. What does management think about the partial solutions built and why?

4.1 Introduction

In this chapter we review the strategy domain. The review is based on a study of literature and the author's own practical experience. We explore the context in which our research is embedded and in so doing derive answers to our fourth question: "what are the requirements for the tools that the context poses for the supporting systems?" An early version of this text has been included in Keijola (1999).

We start by reviewing the concept of strategy and strategic management, the many facets of them. Taking a brief look at the strategist and the organisation follows this. We then move on to the supporting side and discuss data, information and knowledge. The distinction between data, information and knowledge and the process of creating meaning are first considered. We continue by discussing knowledge management and inquiring (learning) organisations. We conclude with a summary of the identified requirements

4.2 Strategy

Strategy encompasses a wide range of aspects. In the following we present a review of some of them as presented and discussed by major authors. We touch on definitions of strategy, how strategy is formulated and evaluated, the many types of strategy, and how strategy is managed. The intent is not to give a comprehensive or detailed view of the different schools of strategy. Rather, the intent is to show how rich in considerations and wide in scope the field of strategy is. We take special advantage of the articles in Mintzberg and Quinn (1996) but cite other scholars and consultants as well.

4.2.1 Nature and Formation of Strategy

Sun Tzu said 2500 years ago about military strategy (Krause (1996)): The elements of strategy are first, measuring; second, estimating; third, calculating; fourth, comparing; and fifth, victory. The terrain creates measurements. Estimates are based on measurements, calculations on estimates, comparisons on calculations and, victory on comparisons. Thus, a victorious army fights its opponents like a heavyweight against a lightweight, or like a large river rushing through a narrow gorge. It cannot be stopped. Success in war is a matter of positioning.

Quinn (1980) defines strategy as the *pattern* or *plan* that *integrates* an organisation's *major* goals, policies and action sequences into a *cohesive* whole. A well-formulated strategy helps to *marshal* and *allocate* an organisation's resources into a *unique* and *viable* posture based on its relative *internal competencies* and *shortcomings,* anticipated *changes in the environment,* and contingent moves by *intelligent opponents.* Strategies develop around a few key concepts and thrusts with allocated resources. Strategy deals with not just the unpredictable but also with the unknowable. The essence of strategy is to *build a posture* that is so strong (and potentially flexible) that the organisation can achieve its goals despite of the unforeseeable ways external forces may interact when the time comes. Complex organisations should have a number of hierarchically related and mutually supporting strategies. A genuine strategy is always needed when the potential actions or responses of intelligent opponents can seriously affect the endeavour's desired outcome - regardless of that endeavour's organisational level in the total enterprise. Criteria for effective strategy include clear and decisive objectives, maintaining the initiative, concentration, flexibility, co-ordinated and committed leadership, surprise and security.

Mintzberg (1987a) presents definitions for the Five P's for strategy: strategy as plan, ploy, pattern, position and perspective. Plan is a *consciously intended* course of action, a guideline to deal with a situation. Ploy is a specific strategy or "manoeuvre" intended to outwit an opponent. Pattern implies that strategy is *consistency* in behaviour, *whether or not* intended. The last two P's refer to the content of strategies. Position is a means of locating an organisation in an environment. Perspective is an ingrained way of perceiving the outside world. The P's are interrelated. Strategy is a *concept.* It is an abstraction that exists only in the minds of interested parties. Strategy is a perspective shared by the members of an organisation, through their intentions

and/or by their actions. The members give rise to the *collective mind.* Strategies can be of many kinds from the rather deliberate to mostly emerging: planned, entrepreneurial, ideological, umbrella, process, disconnected, consensus or imposed.

Andrews (1980) provides a lengthy definition of strategy. Strategy is the pattern of decisions that determines and reveals its objectives, purposes, or goals, produces the principal policies and plans for achieving those goals, and defines the range of business the company is to pursue, the kind of economic and human organisation it is or intends to be, and the nature of economic and non-economic contribution it intends to make to its shareholders, employees, customers, and communities. The strategic decision contributing to this pattern is one that is effective over long periods of time, affects the company in many different ways, and focuses and commits a significant portion of its resources to the expected outcomes. Corporate strategy is an organisation process. It has two important aspects: formulation and implementation. Andrews notes that effective implementation can make sound strategic decision ineffective or a debatable choice successful. Determination of a suitable strategy for a company begins in identifying the opportunities and risks in its environment. A range of strategic alternatives should be identified, and the range narrowed by recognising the constraints imposed by corporate capability. One or more economic strategies at an acceptable level of risk should be determined. Influences of the environment come from many directions: technology, ecology, economics, industry, society and politics. Analysis of corporate competence and resources includes analysis of sources of capabilities and identifying strengths and weaknesses. Opportunity should be matched to competence.

De Geus (1997) argues that companies should be treated more like living organisms rather than machine like and notes that the word *strategy* tends to be misused. It should not be a noun; you should not "have" a strategy, in the sense of a document the organisation follows. Rather, *strategy* should be a verb; strategy is something you *do,* rather than something you *have*.

For Porter (1980, 1985), strategy centres on competition and industry. Porter defines competitive strategy as the search for a favourable competitive position in an industry. The importance of strategic positioning has continued to be important in Michael Porter's thinking. It is reflected in e.g. Porter (1998) and Porter (2001). Competitive strategy aims to establish a profitable and sustainable position against the forces that determine industry competition. The five forces are 1) bargaining power of buyers, 2)

bargaining power of suppliers, 3) threat of new entrants, 4) threat of substitute products or services and 5) rivalry between existing firms. Porter defines and discusses three generic strategies: cost leadership, differentiation and (cost or differentiation) focus. Strategies are different depending on the type of industry: fragmented, emerging, mature or declining. Strategies can be defensive or offensive.

Mintzberg (1988a, 1988b) elaborates on work by Ansoff (1965) and Porter. He proposes that families of strategies can be divided into five broad groupings forming a logical hierarchy (although he notes that strategies do not necessarily develop that way in organisations). The first three are more relevant for business-level strategy and the last two for corporate-level strategy:

1. locating the core business; strategies based on the position of the business in a stream of businesses: upstream, midstream, and downstream,
2. distinguishing the core business; strategies for functional areas: e.g. sourcing, processing, delivering, designing and supporting; strategies for activities in the value chain (Porter (1985)); strategies of differentiation: price, image, support, quality, design, undifferentiation; strategies of scope: unsegmentation, segmentation, niche, and customising,
3. elaborating the core business; strategies for penetration, market development, geographic expansion, and product development,
4. extending the core business; strategies for chain integration, diversification, entry and control, combined integration-diversification, and withdrawal and
5. reconceiving the core business; strategies for business redefinition, business recombination and core relocation.

Mintzberg and Quinn (1996) include discussions about strategies in different contexts: entrepreneurial, mature, innovation, diversified, international and change.

Kay (1993) distinguishes between corporate strategy and business strategy. Corporate strategy is concerned with the firm's choice of markets. Strategy is based on the firm's distinctive capabilities: architecture, reputation, innovation and strategic assets. Distinctive capability becomes competitive advantage when applied in appropriate markets. A competitive advantage is valuable if it is sustainable and appropriable. Business or competitive strategy is concerned with the firm's relationships with its customers, distributors, suppliers, and competitors within chosen markets.

McTaggart et al (1994) advocates value-based management and argues for the creation and evaluation of strategic options. They propose a strategy development

process that facilitates the formulation, evaluation and implementation of options that are likely to increase the value created by each business within the company. To facilitate the *formulation* of meaningful options, management should undertake a detailed strategic position assessment of the business, specifying its market economics, competitive position and current strategy, as well as the profiles of product and customer profitability and the unit's strategic value drivers. To facilitate the *evaluation* of alternatives, each feasible strategic option must be converted into grounded financial forecast so that it can be valued. To facilitate the *implementation* of the highest-value strategy the strategy development process must result in a business plan that includes the specific initiatives and actions required for the business unit's success.

Hamel and Prahalad (1994) represent a resource/core competence-based view: how the firm's resources and capabilities provide advantage over rivals. They advocate a new view of strategy (at the height of the re-engineering boom). Their point is that it is not enough for a company to get smaller and better and faster, it must also be capable of fundamentally reconceiving itself, of regenerating its core strategies, and of reinventing its industry. Hamel and Prahalad summarise their new strategy paradigm in the following tabular format (see Table 4-1). They also refer to the collective mind of the organisation. However lean and fit an organisation, it still needs a brain. But the brain they have in mind is not the brain of the CEO or the strategic planner. Instead it is an amalgamation of the collective intelligence and imagination of managers and employees throughout the company who must possess an enlarged view of what it means to be "strategic".

Table 4-1 The New Strategy Paradigm by Hamel and Prahalad (1994)

Not Only	But Also
The Competitive Challenge	
Reengineering processes	Regenerating strategies
Organisational transformation	Industry transformation
Competing for market share	Competing for opportunity share
Finding the Future	
Strategy as learning	Strategy as forgetting
Strategy as positioning	Strategy as foresight
Strategic plans	Strategic architecture
Mobilising for the future	
Strategy as fit	Strategy as stretch
Strategy as resource allocation	Strategy as resource accumulation and leverage
Getting to the Future First	
Competing within an existing industry	Competing to shape future industry structure
Competing for product leadership	Competing for core competence leadership
Maximising the ration of new product "hits"	Maximising the rate of new market learning
Minimising time-to-market	Minimising time to global pre-emption

Nalebuff and Brandenburger (1996) present a game theory based view on strategy. They realise that companies have to co-operate and compete at the same time. Business is co-operation when it comes to creating a pie and competition when it comes to dividing it up. Nalebuff and Brandenburger claim that game theory is well suited for finding the right strategies and making the right decisions in this kind of world. They advocate that changing the game is the essence of business strategy. The game of business comprises a set of elements: the Players (in a Value Net), the Added values, the Rules, the Tactics (and perceptions) and the Scope. If you change one or more of the elements, you change the game.

Day et al (1997) discusses the increasingly dynamic nature of competitive strategy. The strength of a given strategy is determined not by the initial move, but rather by how well it anticipates and addresses the moves and countermoves of competitors and

shifts in customer demands over time. The strategy's success also depends on how effectively it addresses changes in the competitive environment from regulations, technology, and others. As the pace of change in the competitive environment has increased in many industries, so has the need for the explicit recognition of this dynamism in the formulation of competitive strategies. The new watchwords are anticipation and preparation, for every eventuality.

Brown and Eisenhardt (1998) studied companies in computing related industries. Based on their findings they advocate yet a new approach to strategy. This they term as Competing on the Edge. The underlying insight behind their approach is that strategy is the result of a firm's organising to change constantly and letting a semicoherent strategic direction emerge from that organisation. In other words, it is about combining the two parts of strategy by simultaneously addressing where you want to go and how you are getting there. According to Brown and Eisenhardt Competing on the Edge differs from the more traditional strategic approaches as follows

1. *Unpredictable*. It is about surprise. It is not a planning approach. It is more about making moves, observing what happens, and continuing with the ones that seem to work.
2. *Uncontrolled*. It is about strategy making centred at the business unit, not at corporate headquarters.
3. *Inefficient*. It is not necessarily efficient in the short term. It is about stumbling into the wrong markets, making mistakes, bouncing back, and falling into the right ones. It is about using change to relentlessly reinvent the business by discovering opportunities for growth and letting profits follow.
4. *Proactive*. It is about being early - about trying to anticipate and, where possible, lead change
5. *Continuous*. It is about rhythm of moves over time, not a set of disjoint actions. It is about relentless change that becomes endemic to the firm.
6. *Diverse*. It is about making a variety of moves with varying scale and risk. It is about making lots of moves.

Brown and Eisenhardt compare Competing on the Edge to other models of strategy as shown in Table 4-2.

Table 4-2 Comparing models of strategy, (Brown & Eisenhardt (1998))

	Five Forces (Porter)	**Core Competence (Hamel & Prahalad)**	**Game Theory (Nalebuff & Brandenburger)**	**Competing on the edge (Brown & Eisenhardt)**
Assumptions	Stable industry structure	Firm as a bundle of competencies	Industry viewed as dynamic oligopoly	Industry in rapid, unpredictable change
Goal	Defensible position	Sustainable advantage	Temporary advantage	Continuous flow of advantages
Performance driver	Industry structure	Unique firm competencies	Right moves	Ability to change
Strategy	Pick an industry, pick a strategic position, fit the organisation	Create a vision, build and exploit competencies to realise vision	Make the "right" competitive and collaborative moves	Gain the "edges", time pace, shape semicoherent strategic direction
Success	Profits	Long-term dominance	Short-term win	Continual reinvention

Strategic planning has had its ups and downs in terms of its role in companies. During recent times the emphasis has been more on "doing" rather than "planning", as evidenced by Table 4-2 above. Michael Porter has recently addressed this issue. In Porter (2001) he argues that the Internet does not make strategy obsolete. In reality the opposite is true. It is now more important than ever for companies to distinguish themselves through strategy.

4.2.2 Strategic Management and the Strategy Process

Ansoff (1984) defines *strategic management* as a systematic approach for managing strategic change which consists of:

1. positioning of the firm through strategy and capability planning
2. real time response through issue management
3. systematic management of resistance during strategic implementation.

The objective of strategic management is to assure the continued success of the firm and to secure it from surprises.

For Eden and Ackerman (1998) strategic management is a way of regenerating an organisation, through continuous attention to a vision of what people who make up an organisation wish to do. A crucial outcome from strategic management is that of agreeing a *sense of strategic direction* - a mission, vision, strategic intent, or framework within which strategizing takes place. Emergent strategizing, as depicted in Figure 4-1, is a key concept for them.

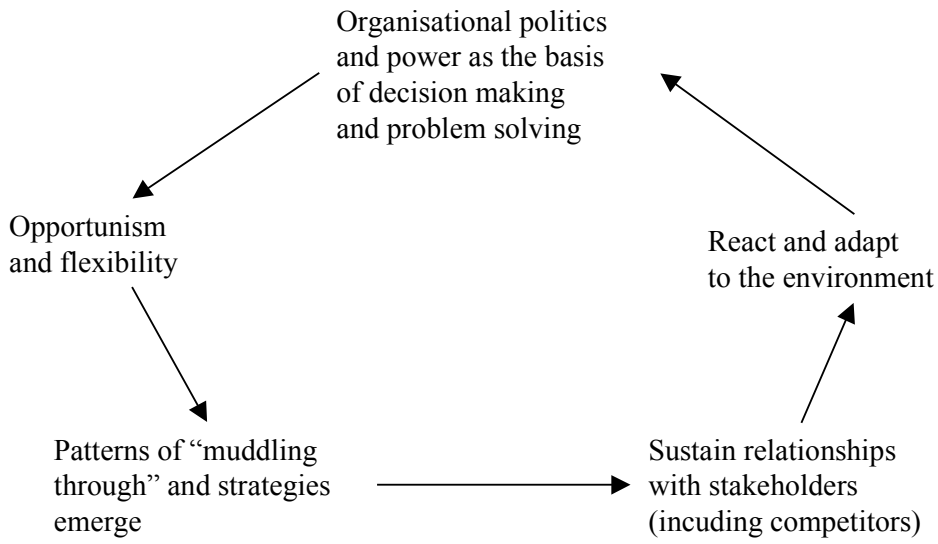


Figure 4-1 Emergent Strategizing, (Eden & Ackerman (1998))

Emergent strategizing implies a journey of *strategy making.* Eden and Ackerman (1998) present a supporting conversational process called JOURNEY for JOintly Understanding, Reflecting, and NEgotiating strategY. Its position in the strategy cycle is depicted in Figure 4-2.

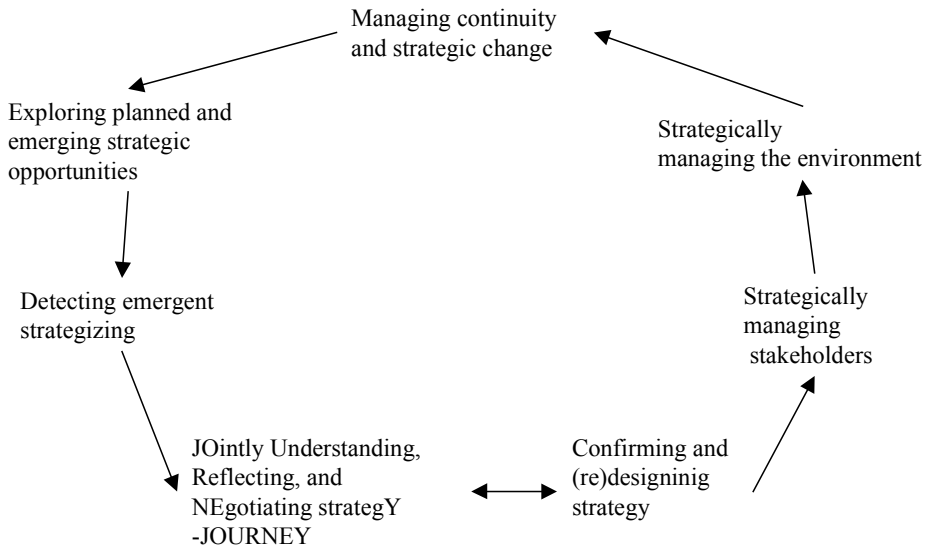


Figure 4-2 The JOURNEY of strategy making and delivery, (Eden & Ackerman (1998))

Mason and Mitroff (1981) present a method of developing and testing strategic alternatives based on the concept of dialectic. It entails taking a (prevailing or recommended) plan and the associated data as a base. The underlying plausible and believable assumptions are then uncovered by asking and answering the question "under what view of the world is this the optimal plan to follow?" Another plausible plan, a counter-plan, is then looked at and its worldview specified. Debate follows in which the plans are forcefully defended using the same bank of data. Finally a synthesis can be formed. Figure 4-3 illustrates this inverse optimal logic scheme.

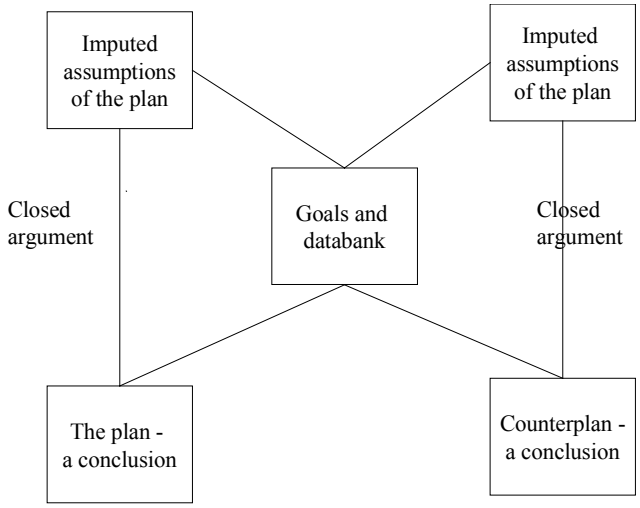


Figure 4-3 Inverse optimal logic, (Mason & Mitroff (1981))

Ahola (1999) gives a model that defines strategy creation, maintenance and strategic issue assessment as a continuous process. It is shown in Figure 4-4

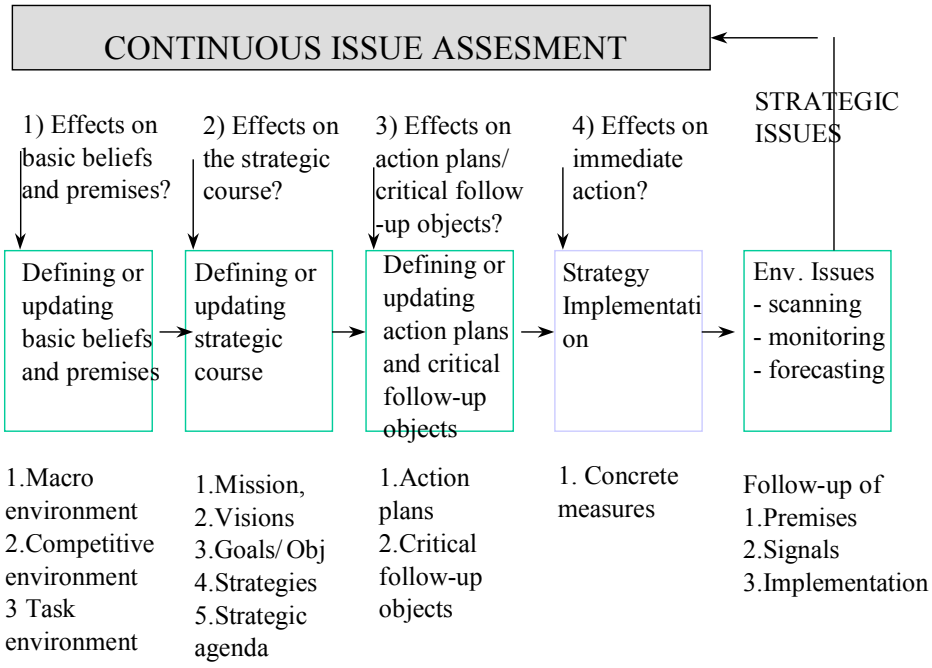


Figure 4-4 The strategy process as Continuous Issue Assessment, (Ahola (1999))

There are many ways in which detail work around strategy can be organised. As an example, Figure 4-5 shows the strategy process of a large Finnish company in the late 1990's (source protected). Since then the process has changed a little as they have incorporated aspects of the Balanced Scorecard regime. However, the extent and the phasing remain essentially the same.

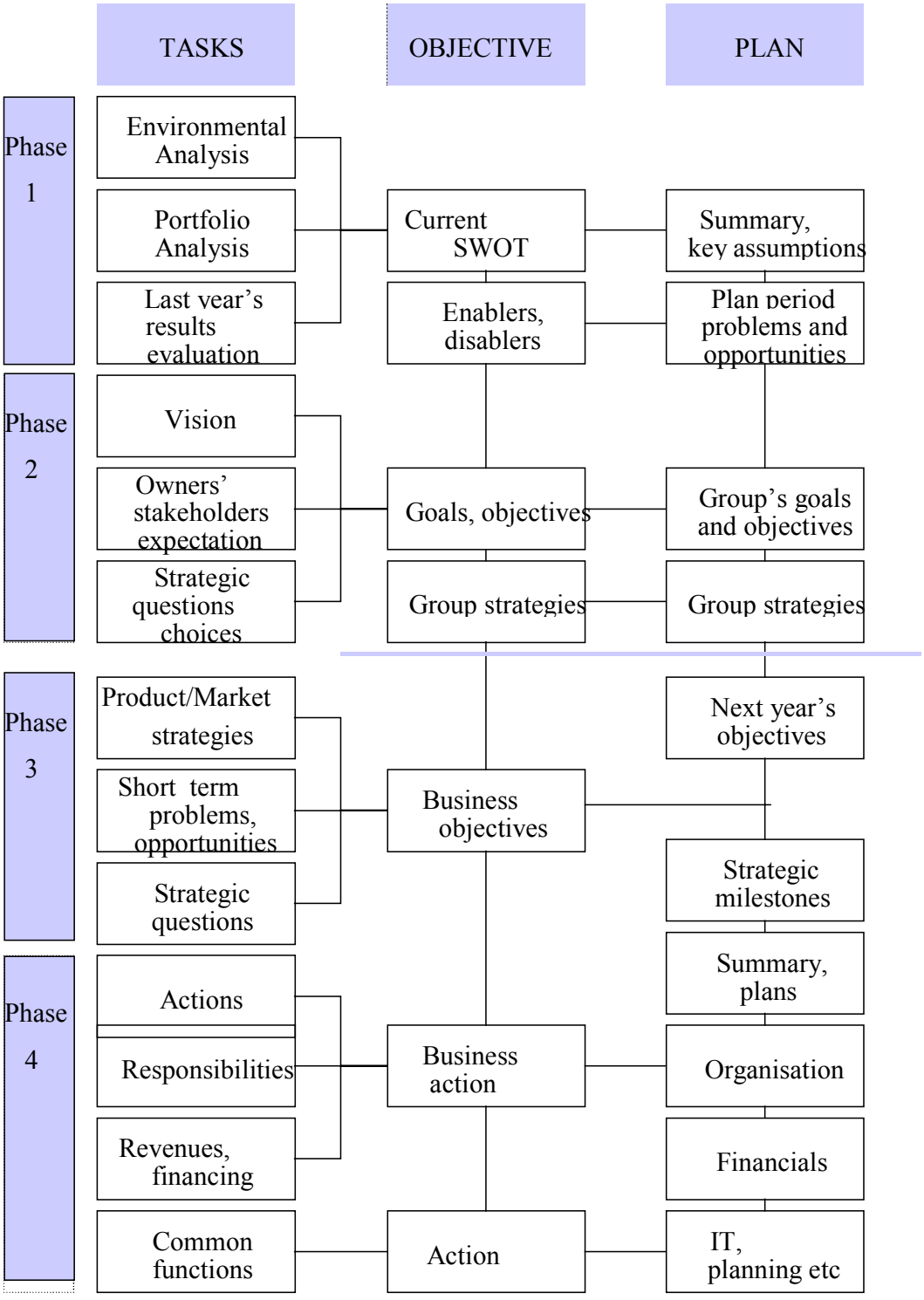


Figure 4-5 The strategy planning process of a large Finnish company, (source protected)

The Balanced Scorecard presented by Kaplan and Norton (1996) can be used as a basis for a Strategic Management System: for clarifying and translating the vision and strategy, for communicating and linking, for planning and target setting, and for strategic feedback and learning. It is a scheme which complements financial measures of past performance with measures of the drivers of future performance. The objectives and measures of the scorecard are derived from an organisation's vision and strategy. The objectives and measures view organisational performance from four perspectives: financial, customer, internal business process and learning and growth.

4.2.3 Models Used in Strategic Planning

Many models are used in the details of strategic planning. Mostly these are analysis techniques to determine the premises of a plan and they serve in contemplating about possible future actions. The premises can be divided in time-dimension to the *current state* and to the *future trends and events*. They can also be divided into the aspects that are *internal* to the business entity and those that are *external* to it. For example, the *portfolio analysis* techniques (e.g. Porter (1980)) are ways to view information about the market and competitive position of the businesses and product lines of a business entity. The *value chains* (Porter (1985)) are a way to organise information about the activities of a business entity, for example, how much an activity adds value and how different activities relate to each other. The *value nets* (Nalebuff and Brandenburger (1996)) describe the relationships of a business entity to other entities – its customers, suppliers, competitors, and complementors – and provide a basis for the analysis of the added value of different players. The *SWOT analysis* (e.g. Porter (1985)) leads to collect and assess information about different aspects of the premises: the strengths and weaknesses of the business entity, as well as the opportunities and threats created by the environment of the business entity. A *market analysis* is a technique to gather and consider information about the structure of the set of the potential customers, and to find out the preferences of the customers. The *scenario analysis* (e.g. Porter (1980)) is a technique to identify potential future developments of the world. Different types of *organisation charts* describe the co-ordination framework in which the strategy has to work. Some models are frameworks to *organise the issues* that should be covered in the analysis.

There are some partial models that are not business entity specific but state empirically observed dependencies between different variables. These models can be thought as partial descriptions of the dynamics of the underlying world. Examples include

- the *experience curve* (e.g. Porter (1980)) describing a nature of the relationship between the cumulative output and unit cost,
- the analysis about the importance of the *market share to return on investment* (Buzzell and Gale (1987)),
- and the analysis about the dependency between the *quality and price* (Davis (1990)).

Causal models could also be defined in a company specific way in the form of *cognitive maps*, *influence diagrams*, and so on.

There are also models that suggest generic, high-level strategic alternatives, like Porter's (1980) generic strategies (cost leadership, differentiation, and focus), or the generic product strategies derived from the product portfolio analyses (invest, milk, divest, study). These can specify a background framework for the specific action programs.

4.2.4 Evaluating and Measuring Strategies

How do we know we have formulated a good strategy? Rumelt (1996) suggests how strategies could be evaluated. He admits that it is impossible to demonstrate conclusively that a particular business strategy is optimal or even guarantee that it will work. One can, nevertheless, test it for critical flaws, The major criteria for a plausible strategy are:

1. *Consistency*: The strategy must not present mutually inconsistent goals and policies
2. *Consonance*: The strategy must represent an adaptive response to the external environment and to the critical changes occurring in it.
3. *Advantage*: The strategy must provide for the creation and/or maintenance of a competitive advantage in the selected area of activity.
4. *Feasibility*: The strategy must neither overtax available resources nor create unsolvable sub-problems.

Buzzell and Gale (1987) define strategy as the policies and key decisions adopted by management that have *major* impacts on financial performance. These policies and decisions usually involve significant resource commitments and are not easily reversible. Buzzell and Gale (1987) concentrate on the performance of business units and thus on the measurable aspects of it. Major dimensions of business strategy for them include the following issues:

1. *Product/Service policies*: quality of products/services, relative rate of new introduction
2. *Pricing policies*
3. *Marketing programs*: sales force, advertising, sales promotion
4. *Investment strategy*: mechanisation/automation of operations, capacity additions, inventory levels
5. *Work force productivity*
6. V*ertical integration*
7. *Research and development*

Buzzel and Gale (1995) present the model shown in Figure 4-6 for the PIMS (Profit Impact of Market Strategy) Competitive Strategy Paradigm. They claim that the measurable factors included in the PIMS model *do* explain most of the variations in business performance among business units, once year-to-year fluctuations are averaged out.

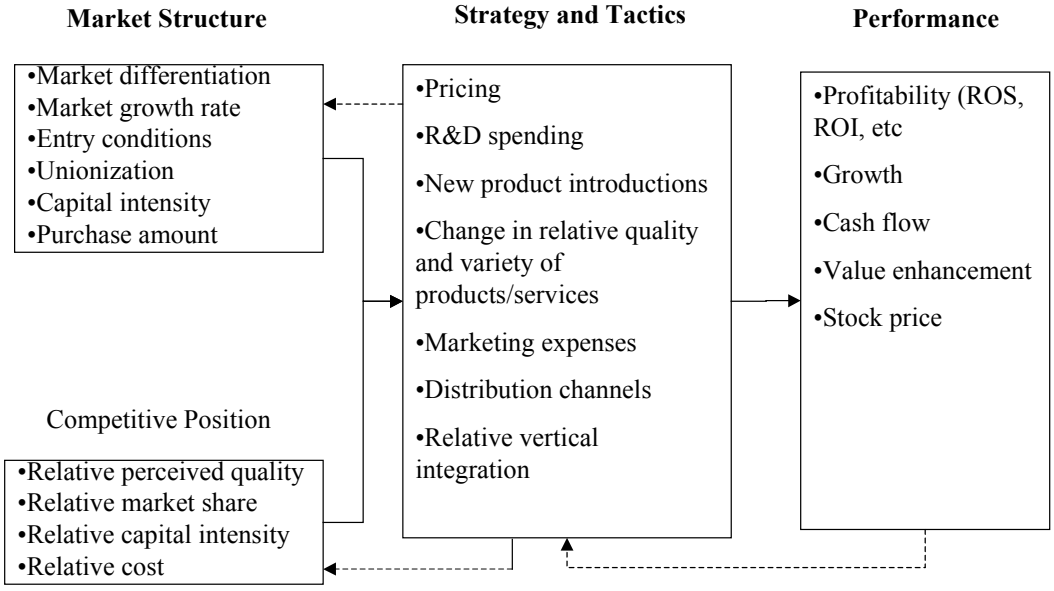


Figure 4-6 The PIMS Competitive Strategy Paradigm, (Buzzell and Gale (1995))

4.3 The Strategist and the Organisation

4.3.1 Introduction

People make strategic decisions, mostly the managers in organisations. Strategy formulation is not a one man's show as shown by Figure 4-7. No treatment of strategy can be separated from people participating in the formulation and implementation of it.

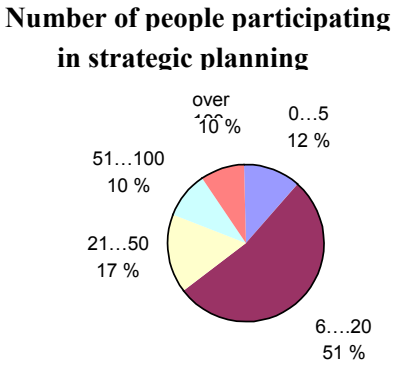


Figure 4-7 Distribution of the number of people participating in strategic planning in selected companies (N = 49), (Säkkinen and Virtanen (1997))

So far we have tended to treat a business as a monolithic entity. It is necessary to understand that a business is a system. Ackoff (1996) defines four types of systems and models based on the purposefulness of the parts of the model and the whole as shown in Table 4-3:

Table 4-3 Types of systems, (Ackoff (1996))

Systems and Models	Parts	Whole
Deterministic	Not purposeful	Not purposeful
Animated	Not purposeful	Purposeful
Social	Purposeful	Purposeful
Ecological	Purposeful	Not purposeful

According to this classification a business is a social system that has social (sub-business) and animated (human) parts. The business (the whole) has a purpose and its parts that make strategic decisions (in particular the human agents) have a purpose.

The business environment could be considered a social system of social systems or ecology depending on one's philosophical inclination.

We now consider the Strategist and the organisation he is part of. The Strategist is a planner, a decision-maker and a potential user of supporting tools.

4.3.2 The Strategist

Mintzberg (1996) states and presents evidence about some (not true) folklore and some facts about managerial work.

1. *Folklore*: The manager is a reflective, systematic planner.
   Fact: Study after study has shown that managers work at an unrelenting pace, that their activities are characterised by brevity, variety, and discontinuity, and that they are strongly oriented to action and dislike reflective activities.
2. *Folklore*: The effective manager has no regular duties to perform.
   Fact: In addition to handling exceptions, managerial work involves performing a number of regular duties, including ritual and ceremony, negotiations, and processing of soft information that links the organisation with its environment.
3. *Folklore*: The senior manager needs aggregated information which formal management information system best provides.
   Fact: Managers strongly favour the verbal media - namely, telephone calls and meetings.
4. *Folklore*: Management is, or at least is quickly becoming, a science and a profession.
   Fact: The managers' programs - to schedule time, process information, make decisions, and so on - remain locked deep inside their brains.

Ohmae (1982) claims that analysis is the critical starting point of strategic thinking of the strategist. However, besides the habit of analysis, what marks the mind of the strategist is an intellectual elasticity or flexibility that enables him to come up with realistic responses to changing situations, not simply to discriminate with great precision among different grades of grey. In strategic thinking, one first seeks a clear understanding of the particular character of each element of a situation and then makes fullest possible use of human brainpower to restructure the elements in the most advantageous way. Phenomena and events in the real world do not always fit a linear model. Hence the most reliable means of dissecting a situation into its

constituent parts and reassembling them in the desired pattern is not a step-by-step methodology such as systems analysis. Rather it is the ultimate non-linear thinking tool, the human brain. True strategic thinking thus contrasts sharply with the conventional mechanical systems approach based on linear thinking. But it also contrasts with the approach that stakes everything on intuition, without any real breakdown or analysis.

McTaggart et al (1994) argue that there are many reasons why managers do not routinely develop strategic options. The most common deterrent is that management lacks both the necessary information and an effective framework for formulating and evaluating strategic options.

Day (1997) states that strategists cannot afford to look at the world from one point of view. Doing so is as dangerous as trying to navigate the freeway with one eye closed. Managers need, instead, a comprehensive framework that uses a variety of lenses and tools to understand a firm's competitive situation, find new sources of advantage, and formulate strategies that competitors are unable to match readily. The difficulty of addressing competitive reactions is heightened because competitive games are played in the fog. Managers have their own blind spots, and the true intentions and the resolve of the competitors are deeply and often deliberately obscured. Their responses are likely to be misunderstood and underestimated.

We assume in the following, somewhat simplistically, that managers have two basic working modes with regard to strategic decision-making, as alluded to in Mintzbeg's first "folklore" and "fact" about managerial fact. The first is a hypothesis-testing, deductive mode, epitomised by continuous issue assessment (Ahola (1999)). The second is an inductive mode, epitomised by emergent strategizing (Eden & Ackerman (1998)).

4.3.3 Wicked Problems

Courtney (2001) describes how decision making in the 21st century is becoming increasingly complex. Business and organisational systems are becoming more integrated, globalisation will spread and the importance of sustainable development, business ethics and corporate social responsibility will increase. The typical number of stakeholders grows. Planning problems for organisations are becoming more

"wicked" as referred to by Rittel and Webber (1973) according to Courtney (2001). Ten properties which are typical of wicked problems, are listed:

- There is no definitive formulation of a wicked problem - formulating the problem *is* the problem.
- Wicked problems have no stopping rule - planners stop, not because the have "the" answer, but because they are out of time, money, patience, or because the answer is "good enough".
- Solutions to wicked problems are not true or false, but good or bad - values are inherently a large part of the problem and the values vary among the stakeholders.
- There is no immediate or ultimate test of a solution to a wicked problem - solutions to wicked problems, because they are inextricably bound to their environment, generate "waves of consequences over an extended - virtually unbounded - period of time".
- Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial and error every attempt counts significantly, and consequentially, solutions cannot be undone.
- Wicked problems do not have a numerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan - there may be no solution.
- Every wicked problem is essentially unique - despite of many similarities, each wicked problem also has distinguishing characteristics that make it unique.
- Every wicked problem can be considered to be a symptom of another wicked problem - again because of their connectedness to the environment and to other problems, "solving" a wicked problem may exacerbate other problems.
- The existence of a discrepancy (between actual and desired states of affair) can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution - the choice is the one most plausible to the decision-maker.
- The planner has no right to be wrong - scientists may formulate hypotheses that are later refuted, but planners seek to improve some aspect of the world. "*The planner who works with open systems is caught up in the ambiguity of their causal webs"*.

The classical rational paradigm of science and engineering are not applicable to problems in open social systems.

4.3.4 Organisations

The strategists work in organisations. Organisations differ in how they approach problem solving and learning. The type of organisation the strategist is part of influences his behaviour. We could pose the same basic ontological, epistemological and methodological questions as posed in Section 2.3.8 to a business planner. Being enlightened, his answers would most probably indicate some other paradigm than the positivist paradigm, i.e. the postpositivism, the critical theory or the constuctivist paradigm as these may better reflect the world of social organisations. In addition to his personal beliefs the type of organisation he is part of would influence his answers.

4.4 Information and Information Systems

4.4.1 Introduction

We now turn to some concepts underlying and supporting strategy. These concepts are important in considering supporting systems. We first review the nature of information and how information is used for creating meaning and knowledge in an organisation. We then go on examining the management of knowledge and inquiring organisations. We endeavour to relate the reviews to the strategy context.

4.4.2 Data, Information, Knowledge, Intelligence

The traditional view of information in relation to data and knowledge is summarised in e.g. Davenport (1997) as shown in Table 4-4

Table 4-4 Data, Information, Knowledge, (Davenport (1997))

Data	Information	Knowledge
Simple observations of states of the world 1. Easily structured 2. Easily captured on machines 3. Often quantified 4. Easily transferred	Data endowed with relevance and purpose[4] 1. Requires unit of analysis 2. Need consensus on meaning 3. Human mediation necessary	Valuable information from the human mind 1. Includes reflection, synthesis, context 2. Hard to structure 3. Difficult to capture on machines 4. Often tacit 5. Hard to transfer

Checkland and Holwell (1998) expand on this model and introduce a new, and in our view, useful concept, *capta*[5]. Their model is shown in Figure 4-8.

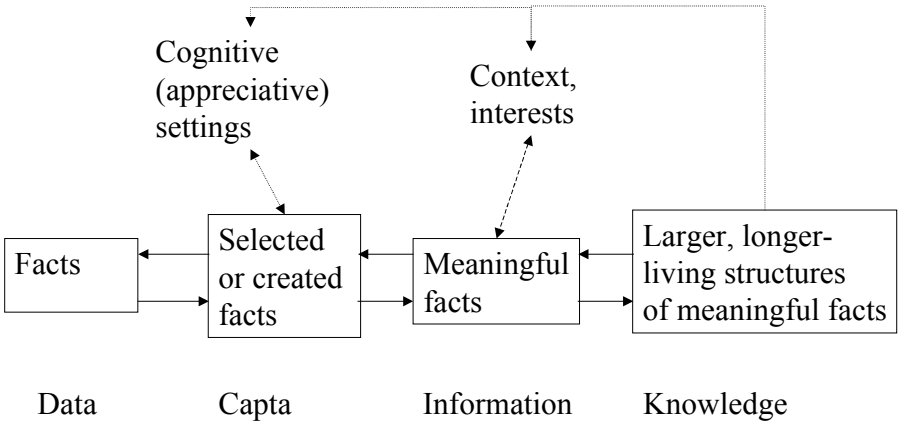


Figure 4-8 Data, Capta, Information, and Knowledge, (Checkland-Holwell (1998))

Capta is the set of facts, selected or created, based on which information or meaningful facts are formed. It acknowledges the fact that there may be more data than what has been used in forming information. The model further shows how the selection of the capta is dependent on the cognitive settings of the analyst and how the attribution of meaning is dependent on the context and the interests of the attributer. The model also shows many interactions that take place between the components of

[4] Definition originally presented in Drucker (1988)

[5] "Capta" is derived from the Latin word "capere", meaning to "take"; it complements the term "data" which is derived from the Latin word "dare", meaning to "give". (Checkland - Holwell (1998))

the model. These interactions arise because the cognitive settings change or because the context or the interests change. Some of these in turn are due to changes in the operating environment and some are due to learning taking place because new information or knowledge is created.

The term *intelligence* relates to the fact that special effort needs to be made to obtain and interpret the data. Fuld (2001), a specialist in competitor intelligence, offers illustrative definitions for data, information, analysis and intelligence as shown in Table 4-5.

Table 4-5 Definitions of Data, Information, Analysis and Intelligence, (Fuld (2001))

Item	Definition	Example
Data	Scattered bits and pieces of knowledge	1990: "The Dun & Bradstreet report told us that the competitor's plant had 100 employees" 1993: "One of our sales people just passed by the competitor's plant and spotted only 30 cars in the lot."
Information	A pooling of these bits of knowledge	"Based on the D&B and the sales report it appears the competitor has lost business."
Analysis	Distilled information	"After gathering more operational information and running it through a side-by-side profit and loss analysis, it appears the competitor has become highly efficient. It exceeds industry standards and has become a best-in-class facility."
Intelligence	The implication that will allow you to make a decision	"The competitor would make a good acquisition candidate. Its lean-and-mean structure would fit well with our current operations."

The Corporate Strategy Board (2000) defines *strategic intelligence* as an activity to provide senior decision makers with timely, comprehensive information about external environment for the explicit purpose of strategy development.

4.4.3 Process of Organisational Meaning

Checkland and Holwell (1998) elaborate on meaning creation. They present a model on how meaning is created in an organisation, what role information systems have to

play in an organisation and how requirements for information systems emerge. This model is useful in the context of strategy support in particular if we accept the highly emergent nature business strategy. It is shown in Figure 4-9. Despite of its apparent complexity it is worth to review it.

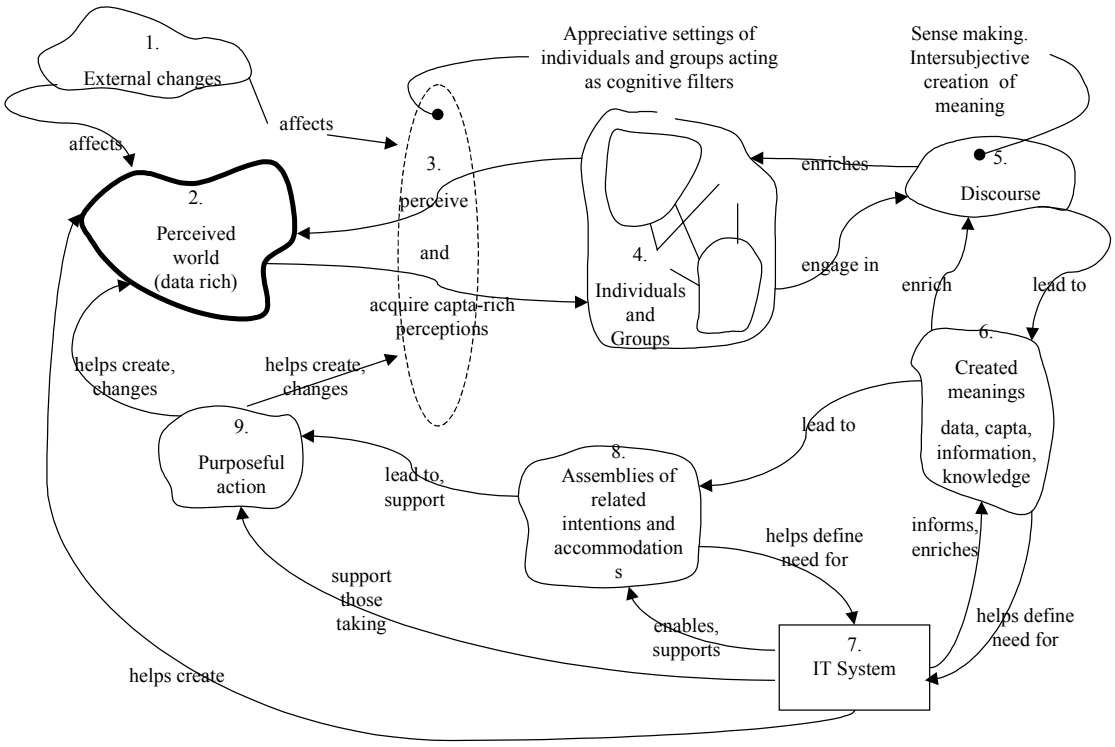


Figure 4-9 The process of organisational meaning, (Checkland – Holwell (1998))

External events (1) and own purposeful actions (9) change the perceived world (2). The world is perceived and capta is acquired through cognitive filters (3) formed by the appreciative settings of individual and groups (4). Meaning (interpretation of the world) (6) is created as a result of a discourse (5) that takes place between individuals and groups. This discourse is based on what individuals and groups perceive about the world. The discourse leads to creation of meaning and that leads to setting of intentions and accommodations (8). Created meanings, intentions and accommodations also help define the need for information systems (7). The role of the information system in this scheme is to support forming of intentions, supporting purposeful actions or causing change directly in the perceived world or in the cognitive settings. (An information system should also support the discourse)

This model is particularly relevant in the dynamic context of business and business planning. The model also partly explains why it has been so hard to create sustainable and useful information systems support for business planning. The strategic decision setting may change all the time as new facts about the environment and strategic probes are obtained. The new facts may lead to new cognitive settings. They may cause new interpretation about the environment. This may lead to new knowledge and change the context of interpretation and lead to new intentions. Any IT system should be able to accommodate to and support this process.

Davenport (1997) discusses the need for information systems supporting change in organisations. He introduces the concept of "Information Ecology" arguing for the need of life-like evolution and holistic approach in managing information. Besides thinking holistically about an organisation, Davenport introduces four key arguments of information ecology: 1) integration of diverse types of information; 2) recognition of evolutionary change; 3) emphasis on observation and description; and 4) focus on people and information behaviour.

4.5 Knowledge Management

4.5.1 Introduction

During recent years Knowledge Management (KM) has become of interest to consultants, management scientists and companies. The general idea is that knowledge is an asset and that the knowledge assets are largely undeveloped and under-utilised. Hence they have to be better managed. Knowledge is of strategic concern. The nature of the knowledge assets needs to be understood and methods of capturing, storing, deploying and managing knowledge need to be developed.

4.5.2 Knowledge

Davenport and Prusak (1998) define knowledge as a fluid mix of framed experience, values, information and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms. In management literature knowledge often appears wrapped up in *related*

constructs such as competence, invisible assets, intangible assets, strategic assets, absorptive capacity, architectural competence, organisational memory, capabilities and skills (Venzin et al (1998)).

Sanchez (1997) argues that knowledge has to be considered in proper contexts. He presents three contexts in which knowledge should be considered. They are depicted in Table 4-6

Table 4-6 Contexts of Knowledge, (Sanchez (1997))

Individuals	Within Organisations	Between Organisations
Articulated vs. Unarticulated	Codified vs. Uncodified	Apprehended Vs. Not-apprehended

Sanchez (1997) also argues that there are some basic differences in the basic contents of an organisation's stock of knowledge. The contents give rise to different theory base, different learning processes and different derived competence. The contents are summarised in Table 4-7

Table 4-7 Contents of Knowledge, (Sanchez (1997))

Kind of Knowledge	Theory Base	Learning Process	Derived Competence
Know-how	State theory	Learning-by-doing	Maintain control of existing processes for making current products
Know-why	Process theory	Theoretically directed learning-by-doing; Importing new theory	Adapt existing products and processes; develop new products or processes
Know-what	Purpose theory	"Bottom up" learning from changes in state and process theory; "Top down" learning by emulation, metaphor or imagination	Identify and define new kinds of products and processes

According to Courtney (2001) several types of knowledge are recognised in the literature: explicit vs. tacit, procedural vs. declarative, esoteric vs. exoteric and

shallow vs. deep. Tacit knowledge (Nonaka and Takeuchi (1995)) is that which is contained in a person's head and is difficult to express. Explicit knowledge is that which can be readily articulated. Declarative knowledge consists of facts or observations about the state of the world. Procedural knowledge involves "how to" do something. Declarative knowledge is close to data or information whereas procedural knowledge is closer to what is normally considered knowledge. Esoteric knowledge is highly specialised, formalised and applicable to narrow domains. Exoteric knowledge is applicable to broad domains. Deep knowledge is usually related to relatively well-structured scientific and technical domains and consists of formal theories of behaviour in those domains. Shallow knowledge is often that in social domains where theories and understanding are usually less well-organised and codified than in scientific domains (Courtney (2001)).

Table 4-8 presents Nonaka and Takeuchi's (1995) view on how knowledge and information interact in a spiral way.

Table 4-8 Converting knowledge to/from information, (Nonaka and Takeuchi (1995))

		To	
		Knowledge	**Information**
From	**Knowledge**	Tacit to tacit (socialisation) Information transfer between people	Tacit to explicit (externalisation) A person transfers knowledge through documents, messages, data
	Information	Explicit to tacit (internalisation) Documents, data, messages convey meaning to a person	Explicit to explicit (combination) Information about information: documents, data, messages are organised into indexes, maps, rules and repositories

4.5.3 Knowledge Management

According to Courtney (2001) Schultze (2001) describes three different perspectives on knowledge management: the functional, the interpretive and the critical. In the *functional* paradigm knowledge management is defined as the way that organisations create, capture, store, re-use and protect knowledge to achieve organisational objectives. This reflects a realist ontology, the belief that the world is factual, and that

the facts can be known, captured, codified and shared. Facts and knowledge are out there to be discovered. The most prevalent technology is a repository of which there are three major types (Bock (1998)): structured (data and knowledge bases), unstructured (notes and documents) and tacit (in people's mind).

In the *interpretive* perspective the basic belief is that social reality is socially constructed. Knowing and knowledge are inseparable from action. Knowledge is viewed both as action and object; that is, as both procedural and declarative. Organisational knowledge exists in a "collective mind" developed through interpretation, communication and shared meanings. It is in a constant state of flux as new experiences are evaluated and shared. Knowledge management in this environment consists of fostering communications between individuals, sharing and enriching interpretations, and co-ordinating actions.

The *critical* perspective is concerned primarily with social conflict and antagonistic relationships. Various stakeholders and special interest groups take positions and form strategies that produce differences and conflict among them. Knowledge management in this perspective is viewed in a rather pejorative way as the exploitation of workers by owners, who seek to extract knowledge from them and commoditisises it.

O'Leary (1998) subscribes to the functional view and defines Knowledge Management (KM) more technically as a process of converting knowledge from the sources accessible to an organisation and connecting people with that knowledge. The converting aspect is summarised in Table 4-9 and the connecting aspect in Table 4-10.

Table 4-9 Knowledge Management Converting, (O'Leary (1998))

Knowledge Source	**Converting Activity**	**Example Knowledge**
Individuals and groups	Knowledge harvesting and sharing	Operations, products, and sales
Data	Knowledge discovery	Fraud or customer-service analysis
Text	Knowledge discovery	News concerning management changes

Table 4-10 Knowledge Management Connecting, (O'Leary (1998))

Connect	People	Knowledge
People to …	Emphasise personal networks and replace "good old boy" networks	Use "pull" technology - search agents and intelligent agents
Knowledge to …	Use "push" technology to send knowledge directly to people	Focus on content instead of document information and link knowledge with multiple paths

According to O'Leary (1998) converting individual knowledge requires knowledge sharing and collection in a form that can be generated and reused. Knowledge harvesting must identify knowledge that is desirable to share, worth converting and usable by others. Piatetsky-Shapiro and Frawley (1991) are quoted to define knowledge discovery as "the non-trivial extraction of implicit, previously unknown, and potentially useful information from data". O'Leary (1998) ends by discussing the limitations associated with focusing on knowledge. Knowledge processes are non-stationary. Knowledge management systems are in danger of providing continually out-dated material. Finally, knowledge alone does not guarantee a creative response to decision making situations.

4.5.4 Knowledge Soup

Sowa (2000) notes the problems of vagueness, uncertainty, randomness and ignorance associated with knowledge. Some of the knowledge in people's heads may be represented in propositions, more of it in image like forms, and the rest of it is in habits, vague intuitions, and "gut feelings" that are never verbalised or visualised. Whatever its form, the knowledge is far too complex and disorganised to be called a knowledge base. Its fluid, heterogeneous, ever changing, and often inconsistent nature could be better characterised as *knowledge soup.* The soup may contain small or even large internally consistent chunks, but they may be inconsistent with one another. The inconsistencies arise from

- Generalisations that omit "obvious" assumptions
- Abnormal conditions
- Incomplete definitions
- Conflicting defaults
- Unanticipated applications

Other problems are caused by

- Multiple uses of the same words
- Vague boundaries of words
- Multiple perspectives
- Intentional granularity

4.6 Inquiring Organisations

We discussed the Strategist and his problems in Sections 4.3.2 and 4.3.3. As was noted organisations pursue solving problems and learn in many ways. The concept of *inquiring organisation* may be helpful in structuring and considering these ways. According to Courtney (2001) inquiring organisations are learning organisations patterned after Churchman's (1971) inquiring systems. These organisations differ in their decision making style, their knowledge perspective, their knowledge creation process and the supporting information technology. There are five flavours of inquiring organisations: Leibnizian, Lockean, Kantian, Hegelian and Singerian each based on the philosophies of their respective namesakes. The organisations might be entire enterprises, social systems, units within an enterprise or even temporary groups or teams in a decision problem-solving situation. Table 4-11 summarises the main characteristics of these organisations.

The Singerian organisation is best suited to deal with wicked problems. It "sweeps in" the other thinking styles where appropriate. It develops multiple worldviews or perspectives into the decision-making situation and employs a holistic systems approach (Courtney (2001)). The principal types of perspectives are technical (T), organisational and social (O), and personal and individual (P). The T perspective is reflected in the four non-Singerian models. The O and P perspectives become crucial in actually making a decision from a set of alternatives (where T is most focused on) and then implementing it. The perspectives of ethics and aesthetics also come into play. Accordingly, Courtney (2001) proposes a new structure for a Decision Support system (DSS) (Figure 4-10). In our view it reflects the realities of strategic business planning situations. We claim that it is appealing to the strategist because of its multi-perspective Singerian philosophy.

Table 4-11 Summary of inquiring organisation characteristics, (Courtney (2001))

	Type of Organisation				
Character-istic	**Leibniz**	**Locke**	**Kant**	**Hegel**	**Singer**
Decision-making style	Formal Analytical Bureaucratic	Open Communicative Consensual	Open Analytical Multi-model	Conflictual	Teleological Co-operative Ethical
Knowledge perspective/ mode	Functional Combination	Interpretative Socialisation	Functional Combination	Critical Socialisation-Externalisation	Interpretative-Critical Socialisation-Externalisation
Knowledge creation process	Induction Mathematical analysis Formal logic	Deduction Observation Classification Communication	Mathematical analysis Multiple models Choose best	Construct thesis, antithesis Dialectic Synthesis	Strategy of disagreement Sweeping-in Multiple perspectives
Information technology	Math models DSS Expert systems Document mgmt	Repositories Groupware Networks	Databases Model mgmt systems	Repositories Negotiation systems	Groupware Networks Repositories Document mgmt

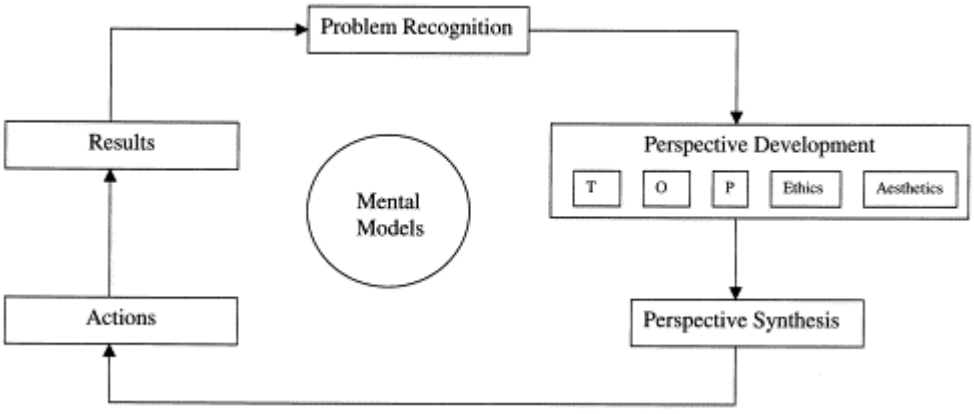


Figure 4-10 A new decision-making paradigm for DSS, (Courtney (2001))

4.7 Summary

In this section we summarise and provide answers to the fourth research question about the major requirements for strategy support systems that have, in our view, emerged from the reviews in this chapter. There are undoubtedly other requirements but the ones identified here represent, in the author's view, critical success factors. These may be the hardest to meet. These are necessary pre-requisites but not necessarily sufficient.

The overview about strategy was intended to show what a diverse field the strategy field is. It has shown in how many different ways strategy can be considered, defined and built. As we have seen, there is an abundance of theoretical viewpoints and it is quite plausible to claim that the practices in companies are richer still. (For a discussion about the history of business strategy see for example Kay (1993)). It may be right to assume no single supporting solution can ever be found.

In the light of the review it is clear that especially in the recent years the dynamic and the uncertainty aspects of strategy have become a major concern. New strategic concepts have been emerging to accommodate this development. Any system intended to support strategy work should therefore incorporate flexibility as its major feature in several ways:

1. Flexibility for accommodating changes in the environment and in the attention of business
2. Flexibility for changing strategic paradigms, to allow for deployment of new concepts in strategy
3. Flexibility in bringing a rich and open set of data into a decision making situation

We have also taken a glimpse at managerial decision making. We have seen how organisations differ in their style of problem solving. We have seen how decisions are and have to be made based on incomplete and inaccurate data. The decision-making situations are often further characterised by the fact that there may be a shortage of time. Attention to all the facts having an influence on the decision cannot necessarily be sufficiently considered due to the vast multitude of facts. There is no shortage of data in most fields. There is often too much data but it may not necessarily be the right kind of data.

Fundamentally, strategy is about survival and prospering in the future for the benefit of the key stakeholders. It is based on a perception (internally and externally) of the current state of affairs and on conjectures about the future. Both, but especially the future considerations are fraught with impreciseness and uncertainty. Considerations such as true reasons for the current competitive position, the expected uses of new technology, and the development of the macro-economic environment cannot always be stated precisely with great certainty and in sufficient detail. Any computer system intending to support strategy should incorporate, in addition to flexibility, tolerance as its major feature. It should

4. Tolerate masses of irrelevant data and arrive at the best capta, set of relevant data
5. Tolerate incomplete and inaccurate data
6. Tolerate and be flexible about the uncertainty of future outcomes, allow for the possibility of dynamic multiple futures
7. Tolerate and be flexible about differences in inquiring organisations

Finally it should have the ability to support the new decision making paradigm:

8. Accumulate timely and comprehensive information and manage dynamic knowledge
9. Process and synthesise multiple views and perspectives in an unbiased way.

We can summarise the issue as *support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.* To remind us about this issue we reprint it immediately after each chapter heading in the rest of this thesis.

Both of the working modes of managers, hypothesis testing and inductive, as discussed in Section 4.3.2, should be kept in mind when support systems are considered.

In the next chapter we review some tools and techniques that are, or could be, exploited in the strategy field as well as some related research.

5 A Review of Tools, Techniques and Technologies

Support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.

1. **What kind of computer based tools exist to support strategy work?**
2. Are the tools used?
3. Is there a need for the tools?
4. **What are the requirements for the tools?**
5. **What could be the solutions for the tools?**
6. Could partial and useful solutions be built?
7. What does management think about the partial solutions built and why?

5.1 Introduction

In the previous chapters we have established at least a weak need for strategy support tools. We have noted, in Chapter 3, that some elementary tools exist but the use of more sophisticated tools is not wide spread. We have, in Chapter 4 gained an overall understanding of the domain where tools should be applied and the major requirements the domain poses. Armed with better understanding of the domain and its requirements we return to our first question: "What kind of computer based tools exist to support strategy work?" In the process of looking at the existing tools and techniques we also gain background on answering the questions about the requirements and the possible solutions.

Tools and techniques that are used, or could be used, in the analysis and support of strategy are now reviewed mainly through study of literature, including exploring the Internet. In addition we describe some experimental studies that have been conducted and lay ground for the description of our solutions.

The discussion about strategy showed what a variety of issues strategy covers. The range of software tools offered to the strategist is also wide. Most tools are quantitative in nature. It is assumed that a human has already massaged data and converted it to numeric form.

In the author's opinion tools for supporting strategy work can be divided in four major categories. We will review these in the following. The categories are

1. Analytic tools supporting separate strategy tasks (Section 5.2)
2. Tools supporting (parts of) the strategy process. Some of these tools also have support for individual tasks (Section 5.3)
3. Integrated tools for synthesis (Section 5.4)
4. Tools of business and competitive intelligence (Section 5.5)

For a more complete albeit somewhat outdated review of the commercially available tools, see e.g. Keijola (1999). We acknowledge that communication is an essential part of the strategy process but such products are not considered here. Also basic products like text processors, spreadsheets and drawing tools are not included.

After the review of the software tools we will present some considerations about electronic sources of information (Section 5.6), present some qualitative techniques that have been deployed to analyse strategic thought (Section 5.7) and describe how text can be analysed with the help of a computer (Section 5.8.3). We finalise the chapter with a summary by revisiting our requirements.

5.2 Analytic Tools for Separate Strategy Tasks

Courtney et al (1997) presents a framework for reviewing the many analytical tools that are available for the strategist. First, they define *residual uncertainty* as that what remains after the best possible analysis of the environment is done, in other words, after the knowable is known. They then define four levels of residual uncertainty in business environments and suggest that the tools to be used should be chosen based on the level where the business finds itself as shown in Table 5-1.

Table 5-1 Levels of strategy and analytic tools (Courtney et al (1997))

	A Clear-Enough Future	Alternate Futures	A Range of Futures	True Ambiguity
What can be known	A single forecast precise enough for determining strategy	A few discrete outcomes that define the future	A range of possible outcomes, but no natural scenarios	No basis to forecast the future
Analytic Tools	"Traditional" strategy tool kit	Decision Analysis Option valuation models Game Theory	Latent demand research Technology forecasting Scenario planning	Analogies and pattern recognition Non-linear dynamic models
Examples	Strategy against low-cost airline entrant	Long distance telephone carriers' local-service market Capacity strategies for chemical plants	Entering emerging markets, such as India Developing and acquiring emerging technologies in consumer electronics	Entering the market for consumer multimedia applications Entering the Russian market in 1992

There exist many software tools and systems that support analysis for strategic decision-making. See e.g. Turban (1996) and Turban et al (1998). Some of the commercially available tools (see also the section for the Websites of the companies in the References of this thesis) include *Policy Planning Tools* which aid in planning the introduction of new policies. The PolicyMaker from PoliMap is an example of this kind of a product. *Strategy Planning Tools* aid in formulating, analysing and describing strategy oriented aspects of the business. These tools include the Planning Pro Series from Enterprise Support Systems, the Business Planning Tool from Strategic Management Group, Business Insight from Business Resource Group and Portfolio Plus from Strategic Dynamics. *Qualitative Data Analysis Tools* aid in analysing non-numerical unstructured data. Nud*ist from QSR and Atlas/ti from Scientific Software Development are examples of these kinds of tools. *Logic, Decision Support and Knowledge Engineering Tools* aid in formulating and structuring data for logical analysis. Decision Explorer from Banxia, PCPack from Integrated Systems Limited and STRAD from Stradspan are some examples of these

kinds of tools. *Visualisation Tools* aid in visualising business plans and situations. Inspiration from Inspiration, InfoGraphics from Trivergent, Active Worlds from Circle of Fire and VizControls from InXight are examples of these. *Document Management Tools* aid in the presentation and dynamic maintenance of the structure of a document, for example a strategic business plan. Trellix from Trellix Corporation is an example of this kind of a product.

5.3 Tools for Supporting the Strategy Process

Tools for supporting (parts of) the strategy process include *Business Plan Writers* that aid in the actual writing of a business plan in addition to providing the basic spreadsheets for financial planning. These tools include BizPlan Builder from Jian Corporation, Business Plan Pro from Palo Alto Software, Business Foundation from Planet Corporation, Business Planner from NetbPlan and Creative Planner from Creative Plan Centre. *Process Support Tools* aid in the planning process. Groupsystems for Windows from Ventana and PathMaker from Skymark for example provide support for structuring the strategy process and especially for supporting group decision-making situations. The StrategyRoundTable from Gryphon Systems is one tool known to the author that provides support for the complete strategy process. It assumes a certain planning paradigm and currently does not provide much flexibility in varying it.

5.4 Tools for Synthesis

These tools are hard to find. *Business games* or *business war games* could be included in this category although their use in business planning may not be straightforward. The business game tools include Business Policy Game from Prentice Hall, the Capstone from Management Simulations, Celcom from Business Visuals and the Global Business Game from South Western College Publishing. An example of a war game is the ValueWar from Advanced Competitive Strategies.

As an example of comprehensive systems Carlsson and Fuller (2002) describe the Woodstrat project. The Woodstrat offers intuitive and effective strategic planning support with object-oriented expert systems elements and a hyperknowledge user interface. Carlsson and Fuller (2002) further discuss future trends in fuzzy reasoning

and decision making. They introduce a complete software agent based scenario planning and interpretation scheme, parts of which they have implemented.

5.5 Tools for Business Intelligence, Competitive Intelligence

5.5.1 Introduction

Intelligence gathering is a key process in strategy work. As such it deserves special review. The business intelligence and competitive intelligence terms are sometimes used interchangeably and that is what we tend to do, too. Strictly speaking, there is a distinction, however. *Business intelligence* (BI) is the product of analysing quantitative business data, usually business transactions; but other sources of data can be used, for example, human resources data. It provides insights that will enable business managers to make tactical decisions, as well as to establish, modify, or tune the business strategies and processes in order to gain competitive advantage, improve business operations and profitability, and generally achieve whatever goals management has set (Tiedrich (2001)).

Competitive Intelligence (CI) is a systematic and ethical program for gathering, analysing, and managing external information that can affect a company's plans, decisions, and operations (Society of Competitive Intelligence Professionals, http://www.scip.org/ci/[6]).

Business intelligence software typically deals with data warehouses and quantitative analysis, almost exclusively of a company's internal data (e.g., CRM, customer relationship management data). The competitive intelligence process depends heavily on the collection and analysis of qualitative information that includes both internally-generated and externally-available data (Fuld (2002)). Both of our studies referred to earlier, (Säkkinen and Virtanen (1997) and Niininen (2001)), showed that information about competitors was the hardest to come by.

Fuld (2002) describes the CI process as forming a cycle comprising five stages as depicted in Figure 5-1.

[6] Accessed on September 17, 2002

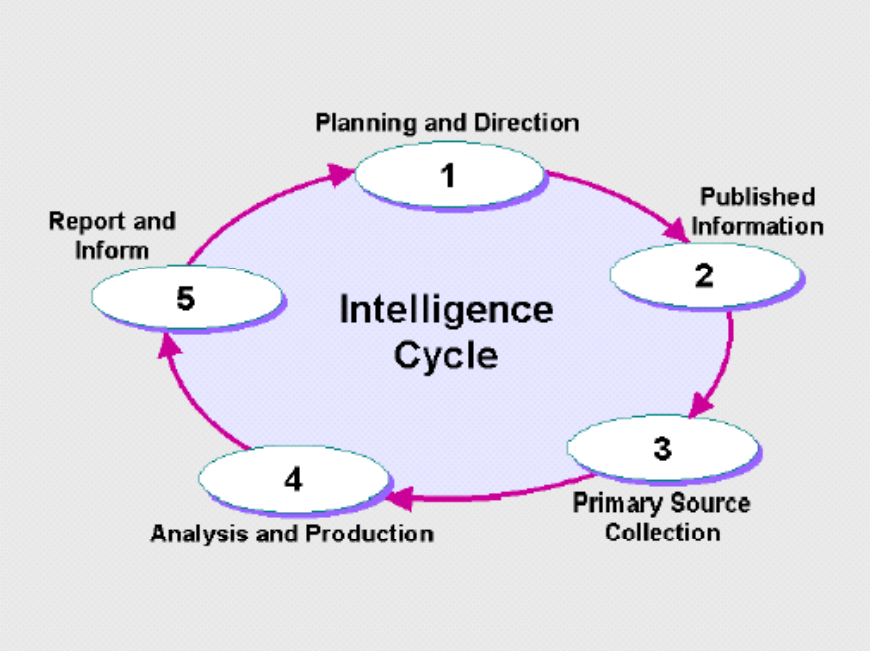


Figure 5-1 The Competitive Intelligence cycle (Fuld (2002))

In the *Planning & Direction* stage the questions and decisions that will drive the information-gathering phase are defined. *Published Information Collection* involves e.g. primary search on Yahoo or Google. A secondary search covers a wide range of sources, from government filings to arcane journal articles to vendor brochures and advertisements, many of which are not available online. *Primary Source (Human Intelligence) Collection* involves gathering information from people rather than from published sources. In the *Analysis and Production* step the analyst transforms the collected data points into a meaningful assessment that uncovers both implications and possible outcomes. Analysis differs from mere information summarisation or synthesis in that it is made up of judgements and conclusions that is the product of the analyst's thought process. The *Report & Inform* set involves the delivery of critical intelligence in a coherent and convincing manner to corporate decision-makers -- the intelligence customer. Fuld (2002) notes that human involvement is necessary in all of these steps.

Fuld (2002) analyses 13 software packages that are considered to cover several stages of the intelligence process. Many of the packages are good in supporting information gathering but the packages of main interest here are the ones with best support for the analysis phase. These are

1. ***Intelligence*** (Brimstone AB)
2. ***ClearResearch Suite*** (ClearForest Corporation)
3. ***Market Signal Analyzer*** (Docere Intelligence)
4. ***STRATEGY!*** *Version 2.5* (Strategy Software, Inc.)
5. ***Wincite*** *Version 7.0* (Wincite Systems LLC)
6. ***WisdomBuilder*** *3.1* (WisdomBuilder LLC)

5.5.2 Clear Research

The product that is considered by Fuld (2002) most advanced is the ClearResearch Suite from the ClearForest Corporation. We describe it in more detail here. The source of the description is www.clearforest.com [7].

According to ClearForest they enable users to instantly pinpoint valuable, relevant information from any source. The general technology of the company's products is depicted in Figure 5-2. It shows how they start with unstructured text. Subsequent structural, statistical and semantic analysis then produces XML (Extensible Mark-up Language) tags that can be exploited in later analyses.

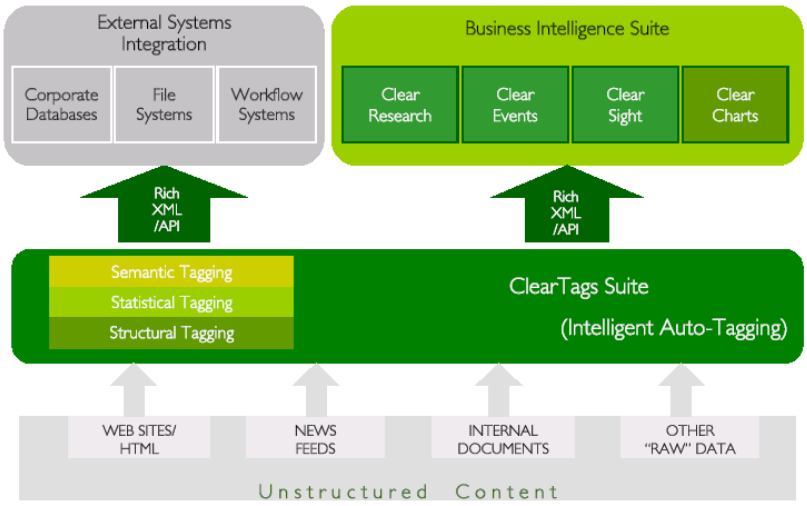


Figure 5-2 ClearForest technology (www.clearforest.com)

ClearForest's technology assimilates text data of any size and structure, extracts key terms, assigns them to meaningful categories (a *taxonomy*, see Figure 5-3), and establishes their inter-relationships. The result is a highly structured, "intelligent"

[7] Accessed on 2002-09-12

body of information that users can slice as needed, generating within seconds insightful patterns in a variety of visual forms such as maps, tables and graphs.

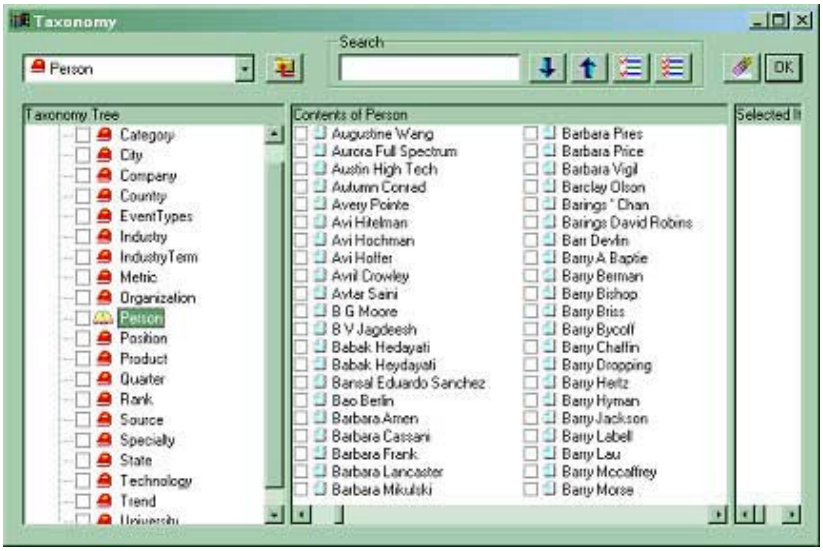


Figure 5-3 A Taxonomy (ClearForest)

This technology allows for a broad set of applications as it can be modified for any vertical domain or business task by incorporating a *rulebook* (see Figure 5-4). A rulebook is a set of instructions describing specific linguistic patterns relevant to a particular vertical market or horizontal discipline. The rulebooks tell the Knowledge Extraction engine what concepts and relationships to retrieve from the text documents.

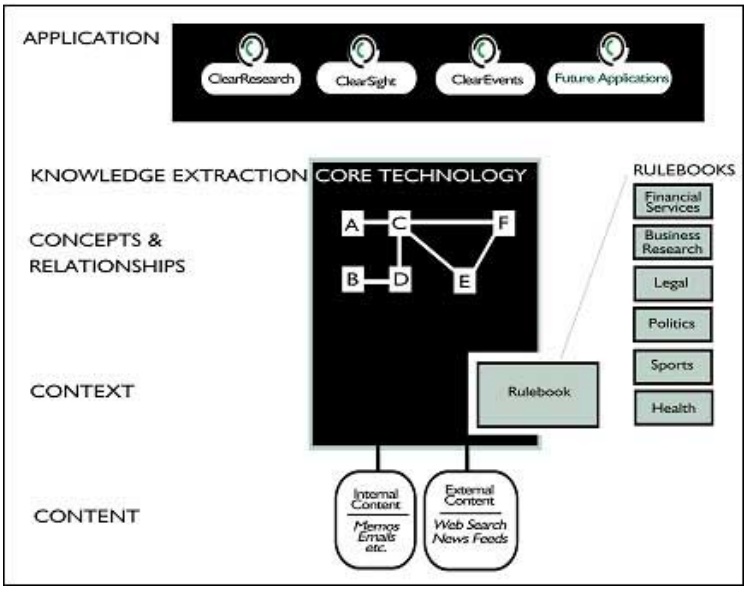


Figure 5-4 Rules and Knowledge Extraction (ClearForest)

Information specifically relevant to each user's needs is extracted and displayed in a variety of simple, visual maps with which the user can interact. Relationships, patterns, updates and trends are automatically identified. Dynamic browsers (see Figure 5-5) allow users to drill-down and roll-up the visual maps as needed in order to focus on the relevant results. Throughout, the system maintains links to the original documents, allowing the user to access the actual documents that contributed to the discovered pattern.

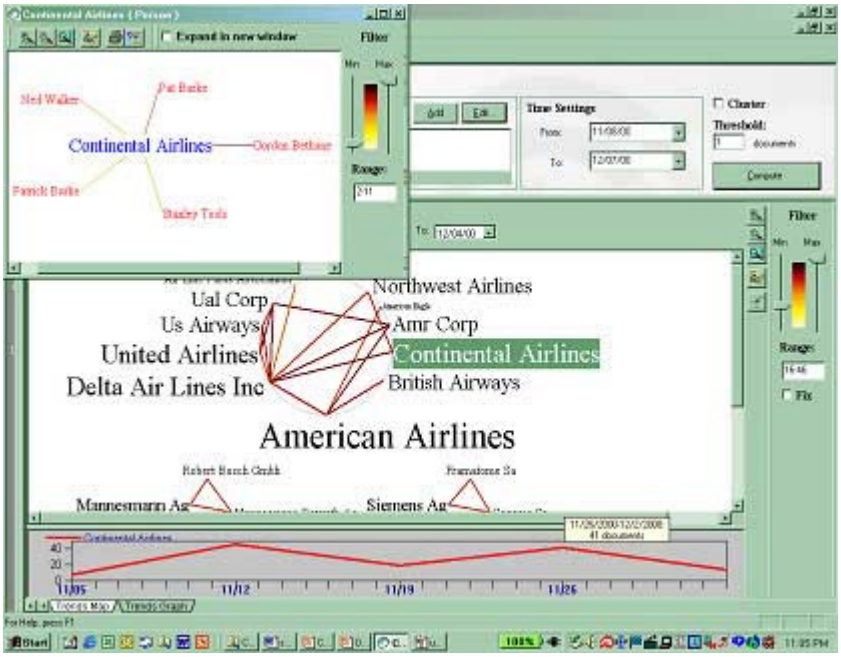


Figure 5-5 Relationships (ClearForest)

According to ClearForest they can rapidly address a broad array of user needs across any market by developing new rulebooks which can be created and customised for any market sector using VARs and customer-specific expertise. The main products included in the ClearForest Business Suite are

ClearResearch: a flexible analysis application designed to gain powerful insights from large document collections.

ClearEvents: for automatically extracting events out of news feeds and posting to various alerting systems.

ClearSight: for interactive and rapid understanding, or for updating oneself on a specific topic.

ClearCharts: for looking at automatically extracted market events superimposed on stock charts, ClearCharts provides profound insights for investment-related decisions.

5.5.3 Summary

Fuld (2002) notes in its Executive Summary that "Analysis is undoubtedly the single most important step of the Intelligence Cycle. Unfortunately, the current state of commercial technology cannot adequately address this stage of the intelligence process. In the past year, however, we have reviewed some analysis tools that are taking steps in the right direction**.** The application of cutting edge artificial intelligence techniques now lead to the dynamic extraction of relationships between multiple entities in a collection of unstructured text. This kind of solution can assist CI analysts in seeing novel linkages and could present them with new avenues for research that may have been missed otherwise. It will be interesting to see the evolution of this technology in the years to come."

5.6 Sources of Information

5.6.1 Importance of Sources

In the studies referred to earlier (Säkkinen and Virtanen (1997) and Niininen (2001)) the importance of the sources of strategic information were also queried. The answers are depicted in Figure 5-6. Own personnel are considered the most important source, then market research.

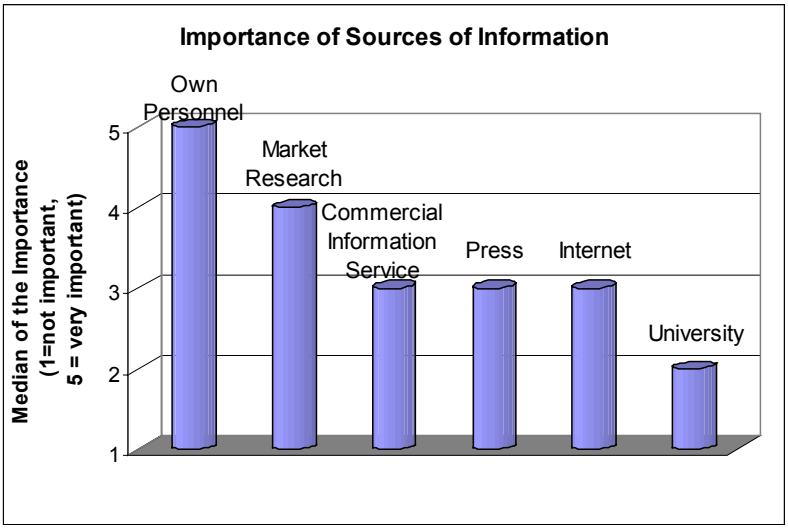


Figure 5-6 Importance of sources of information (37 respondents) (Niininen (2001))

The Internet was still not deemed a very important source of information. However, the strategists had significantly changed their view about the importance of the Internet as a source of strategic information. This can be seen by comparing the results of the two studies in Figure 5-7 and Figure 5-8.

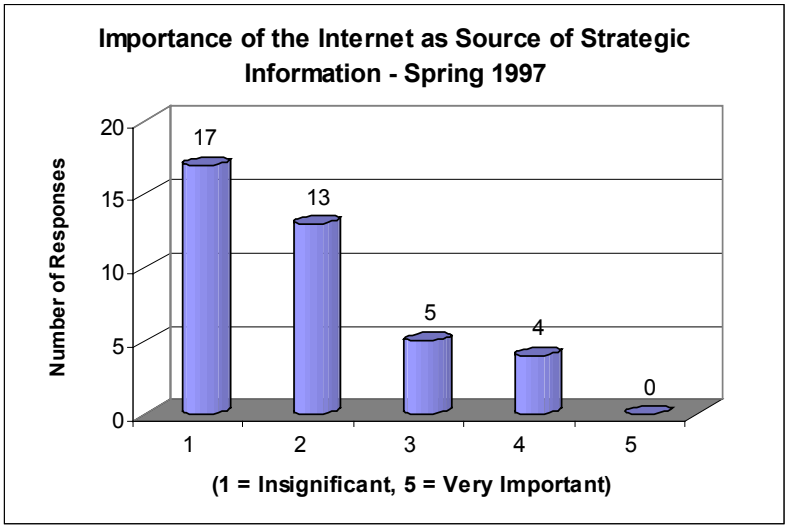


Figure 5-7 Importance of the Internet as a source of strategic information, (39 respondents) (Säkkinen and Virtanen (1997))

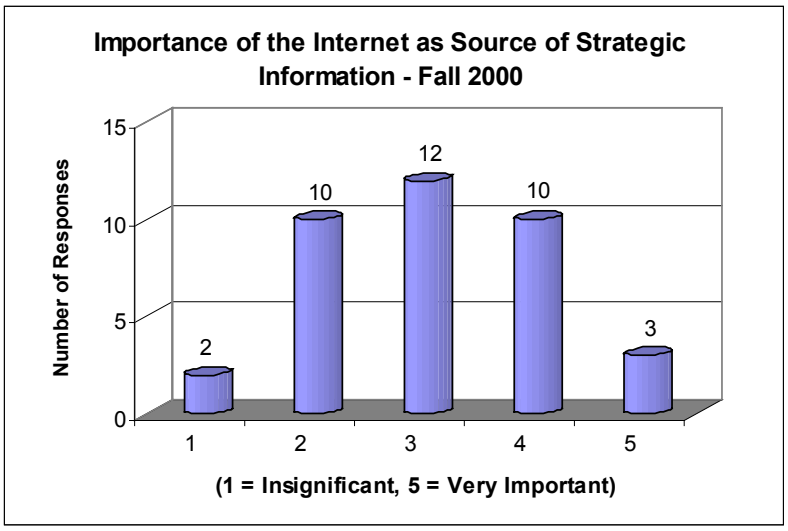


Figure 5-8 Importance of the Internet as a source of strategic information (37 respondents) (Niininen (2001))

5.6.2 Evaluation of News Services

There is no shortage of electronic data. They come in many forms as Figure 5-9 shows.

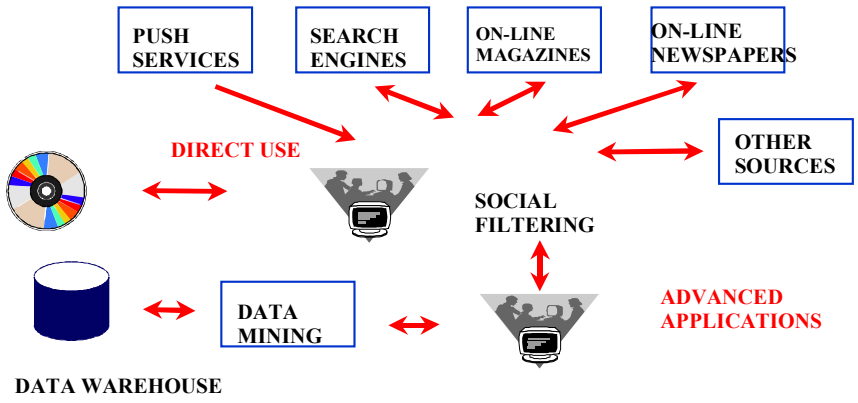


Figure 5-9 Electronic sources of information (Ranta (1999))

Ranta (1999) performed an evaluation of some news services. The summary of the results of the evaluation is shown in Table 5-2. Lots of evolution has since 1999 taken place especially in the navigational and personalisation features of the services. However, for the purposes of this research they are not deemed significant because the sources as such are not of prime interest to us. The study is here presented as a matter of completeness.

Table 5-2 Evaluation of some news services (Ranta (1999))

Name/ Feature	Ft-Online	Bw-Online	Economist Online	Tech Web	Infoseek	Reuters Search
Address	www.ft.com	Www.businessweek.com	www.economist.com	www.techweb.com	www.infoseek.com	www.briefing.reuters.com
Nature	On-line newspaper	On-line magazine	On-line magazine	On-line newspaper	News and Search Services	News and Search Services
Focus	Business, Economy	Business, Economy	Business, Economy	Electronics, ICT	General, Wide	General, Wide
Special	Deeper and focused analyses with a special price	Wider than printed edition		Focused, but based on several accessible on-line magazines		
Regional Coverage	Global with European focus	Global with US focus	Global with European focus	US focus	US focus	Global
Languages of source material/ articles	English	English	English	English	English	Many; e.g. all the European languages
Archives	Yes; 30 days back free	Yes; special price for on-line sub-scribers	Free for on-line sub-scribers	Yes; free	Yes; free	Yes; based on free text search – main feature
Person-alisation	No	No	No	No	Yes, flexible; and free keywords	Yes, flexible and free text based
Download/ off-line	No	No	No	No	Some versions have had	No, special Select Service for this
Price	Free	Annual subscription	Annual subscription	Free	Free	Based on access time, organisation specific

5.6.3 The Internet as a Source of Information

We conducted two early studies to learn about how the Internet could be exploited in an inquiry. One study was called "Finding and Understanding Information in the Internet" and the other study was called "Finding Information in the Internet to Test Hypotheses". They have been reported in more detail in Keijola (1999). These studies gave some further answers to the "what are the requirements for the tools" question and even some background information to the "what could be the solutions for the tools?" question. The abbreviated summary of the first study is reproduced in the following and the second study is discussed in Section 6.3.6 in the connection of exploring a particular business hypothesis.

5.6.3.1 A Study in Finding and Understanding Information in the Internet

In this study four test cases were defined and two intelligent agents, actually human beings were tasked to conduct the cases. Their job was to find answers to the questions posed as well as to observe and document the process of finding relevant information and developing the answers to the questions posed.

5.6.3.1.1 The Test Cases

The cases were defined as follows:

> *Case 1, Technology Trends*: What are the ten most important underlying global technology trends up to year 2020?
>
> *Case 2, Mobile Services*: Which new services and applications are developed which will increase the usage, in terms of both air time and messaging, of mobile phones?
>
> *Case 3, Fuel Cells*: What are the most significant global trends in fuel cells?
>
> *Case 4, Controls*: What are the development and trends in electronic and electric controls in mechanical devices, telemanipulators and industrial robotics?

The objectives for each of the exercises were defined as twofold

> To gain experience about the *process* of information gathering and evaluation using the Internet as a source of information
>
> To find some new valuable information, *content* either by observing (from the Internet) the evidence directly or by combining it in new ways.

5.6.3.1.2 Summary

The central conclusions of the information process aspects of the case study projects were that

1. The cases differed significantly in how they were, and had to be, processed.
2. The Internet is not a uniform source of information.
3. In all cases a frame of reference, a recognised context, had to be conceived of if it was not given clearly enough at the outset
4. The processes did not, and could not progress sequentially from one stage to the next. Instead different phases were intermingled, parallel and convoluted. There was high interaction between all the elements visualised in the Checkland-Holwell model. Learning was an essential ingredient for the successful conduct of the research. This type of learning should be supported by any system augmenting information-based research.

In the following summary table (Table 5-3) the issues raised in the project are summarised. The cases are ranked with respect to the issue. The ranking is based on somewhat subjective evaluations of the students and the author. It can be seen that the profiles of the cases differ considerably. No doubt, had we had more cases, yet more profiles would have resulted.

Table 5-3 Summary of the features of the four cases

Issue	Technology Trends	Mobile Services	Fuel Cell	Controls
Understanding the domain	Very difficult	Easy	Easy	Difficult
Ease of focusing	Very difficult due to wide scope of case	Easy	Easy	Difficult
Amount of relevant information available in the Internet	Very large	Some. (Advanced services are still few)	Large	Little.
Scope and depth of relevant information for the case and perceived value of the Internet as a source for information	Wide, varying depth, good	Moderate scope, moderate depth (commercial information)	Wide, deep, good	Narrow, shallow Very low for general questions related to suitable control systems Moderate (commercial) for specific questions regarding particular technology
Source nature of data acquired	Research	Commercial	Research and commercial	Research supplemented with commercial
Dynamics (change rate) of information available	Dynamic	Very dynamic	Dynamic	Not important
Urgency of information (need to have access to the latest information)	Not urgent	Very urgent	Moderate	Moderate
Language requirement	English sufficient	Multiple languages	English sufficient	English sufficient

5.7 Qualitative Analysis of Strategic Thought

5.7.1 Introduction

Qualitative analysis of text and speech in order to understand the way people and societies think and act is common in philosophy, social and behavioural sciences. This type of analysis has over the last decades been extended to the understanding of the nature and structure of *strategic thought*. Various techniques to qualitatively analyse and develop strategic thought have been used. Some of them are briefly discussed here.

The reason for doing this review is that we are interested in capturing thoughts expressed qualitatively in e.g. business plans and other business documents, and in relating those thoughts to the qualitative reporting of news and events in the business environment. The qualitative thoughts form business hypotheses and the news reports represent evidence that could be used to validate hypotheses and arguments presented in business plans.

Mason and Mitroff (1981) developed concepts and processes to surface and challenge strategic planning assumptions. A major collection of studies in strategic thought is in Huff (1990). The following discussion owes much to these two sources.

Strategic thought has been qualitatively analysed by e.g. studying strategic statements issued by officials of companies in their Annual Reports, in their speeches and in other publicly available documentation as well as by interviewing company officials. Huff (1990) defines five families of study which "tend to fall along a continuum demanding increasing interpretative input from the researcher":

1. Assessing attention, association and importance
2. Dimensions of categories and cognitive taxonomies
3. Causal maps
4. Strategic arguments
5. Narrative semiotics

In the following we describe briefly what is involved with regard to these families. We then summarise and offer some views about what it would mean to computerise some aspects of them.

5.7.2 Assessing Attention, Association and Importance - Content Analysis

Strategic text can be submitted to *word-based content analysis*. One or more of the following assumptions are then made

1. Frequency of word use is a reflection of cognitive centrality.
2. Related words can be clustered to indicate themes of importance.
3. Change in word use can be taken as an indicator of changing attention.
4. Juxtaposition of words can be taken as an indicator of mental connection between concepts.

More complex associations among concepts can be specified as text is analysed. For example, the use of a concept can be indicated along three scales: *evaluation* (positive - negative), *potency* (strong - weak) and *activity* (active - passive). We will return to content analysis in Section 5.8.2.

5.7.3 Dimensions of Categories and Cognitive Taxonomies

5.7.3.1 Description

Compared to what is possible with content analysis more specific links among concepts can be shown starting from the following kinds of assumptions:

1. Thinking involves search and retrieval from organised memory.
2. Learning involves categorisation: modification of old categories or the formation of new ones.
3. Meaning of concept arises from its contrast with other concepts.

Repertory grids and *concept hierarchies* are the main techniques in this category. In a study using repertory grid, a number of elements (objects) such as people or stakeholders or properties of people or objects such as strategies are selected. The elements are then used to elicit constructs that people use in organising cognitively. Lastly, to find ordering the individual elements are placed along the dimensions specified by the constructs.

5.7.3.2 Implications to This Research

It is conceivable that the creation of repertory grids or concept hierarchies could be supported by computer analysis of text dealing with a domain. In particular this support could aid in placing elements along dimensions identified in advance. Identifying categories from text could be difficult since humans tend to assume the audience already knows what the categories are and thus only tend to use the values of attributes.

5.7.4 Causal Maps

5.7.4.1 Description

Causal maps are based on the ideas that

1. Causal associations are the major way in which understanding about the world is organised
2. Causality is the primary form of post hoc explanation of events
3. Choice among alternative actions involves causal evaluation.

Causal maps typically take a form as depicted in Figure 5-10 showing the direction of causes and their influences. The influences can be positive or negative.

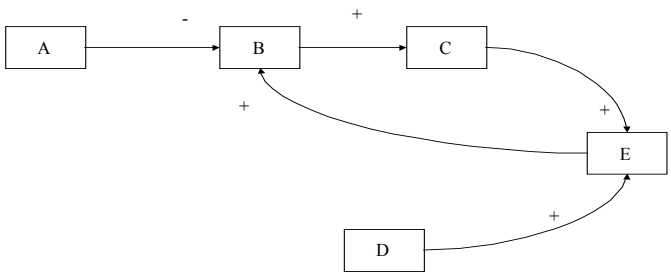


Figure 5-10 A causal map (Huff (1990))

One important consideration with cognitive maps related to strategy is that for several reasons we can only see partial maps as is illustrated by Narayan and Fahey (1990) in Figure 5-11.

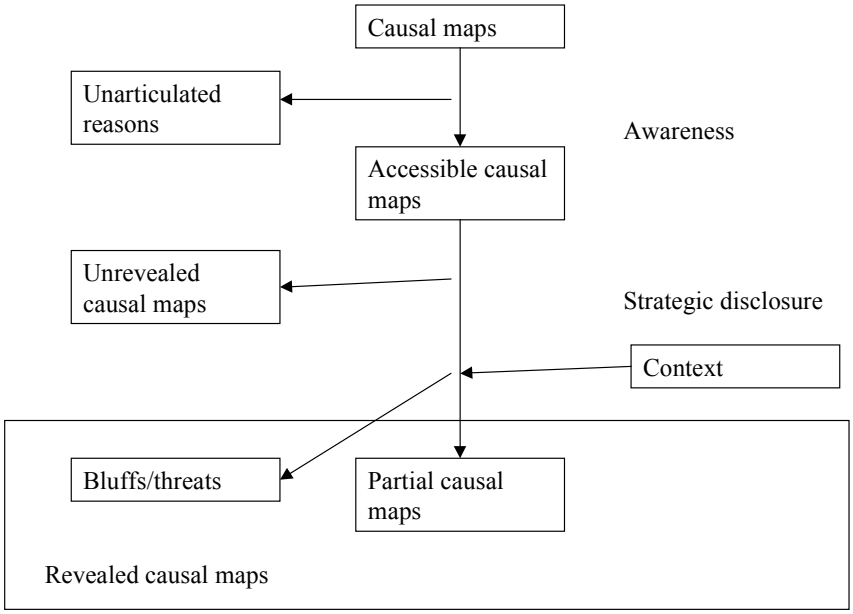


Figure 5-11 Partial causal maps (Narayan and Fahey (1990))

5.7.4.2 Implications to This Research

Causal maps could have many uses in strategy work as e.g. Eden & Ackerman (1998) shows. They could be useful to describe the logic of a strategy or part of it, to relate pieces of evidence to chains of events. Changes in the publicly revealed causal maps can be used to identify change in strategy etc. Let us now assume that a strategic issue has been described with the aid of a causal map. We could then be interested in collecting further evidence to verify that the logic holds as time goes by. For that we need to follow-up both

1. What conclusions the new evidence will lead to when applied by the logic of the causal map and,
2. Equally importantly, that the new evidence supports (or rebuts) the structure of the logic.

Causal maps are in principle simple to understand to a human being. However, they can get quite involved. Especially, if e.g., some weights are assigned to the relations. Programs, such as the Decision Explorer from Banxia, exist for augmenting the creation, analysis and presentation of maps. Developing computer support for actually expressing and analysing the logic of a cognitive map can quickly become quite complex as will be shown in "Testing of Business Hypotheses" in Section 6.3.

5.7.5 Strategic Arguments

5.7.5.1 Description

A business plan can be considered as the manifestation or outcome of complex *argumentation* by the management of the business regarding the future of the business. Huff (1990) lists the salient assumptions in the study of strategic arguments as follows

1. *Decisions to act* involve assessing *evidence* for and against an action.
2. The *evidence* is almost always *inconclusive* and therefore strategists must search for the argument that is strong enough to warrant action.
3. *Disagreements* within a decision making group are rarely over facts, they are often rooted in the implicit *assumptions* that lead to choosing and interpreting facts.

The power of human *cognition* involves the ability to *'nest'* arguments so that one chain of logic becomes the basis for additional conclusions.

5.7.5.2 Toulmin's Model

The French philosopher Steven Toulmin has presented a generic model of the structure of an argument. It is shown in Figure 5-12

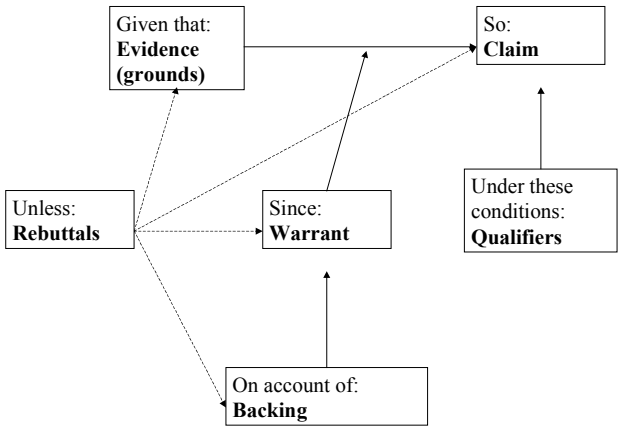


Figure 5-12 Toulmin's argument model (modified from Huff (1990) and Bronn (1998))

Claims are the conclusion of an argument. Fletcher and Huff (1990) classify claims further as follows

1. *Designative* which establish the existence (or non-existence) of an entity, concept, condition or action.

2. *Definitive* which define the characteristics that a given action, condition, entity or concept has or does not have.
3. *Evaluative* which assign values (positive or negative) or judge relative value of a given action, condition, entity or concept.
4. *Advocative* which call for a course of action.

Fletcher and Huff also present how the four categories can be further broken down by identifying time frame - past, present, future as shown in Table 5-4.

Table 5-4 Types of claims and time frame (Fletcher and Huff (1990))

Type	**Past**	**Present**	**Future**
Designative	It was	It is	It will be
Definitive	What it was	What it is	What it will be
Evaluative	It was worth y	It is worth y	It will be worth y
Advocative	It should have been done	It should be done now	It should be done in the future

E*vidence* is what is offered in support of a claim. According to Fletcher and Huff (1990) evidence can be further classified as *facts (scientific, legal, accounting data), common knowledge* or *opinion or citations from an authoritative source.*

Warrants connect the evidence to the claim. Warrants show in what way the evidence supports the claim. They represent the reasoning behind the claim. Fletcher and Huff (1990) present three types of warrant or classes of argument:

- *Substantive* which refers to facts or logic. Mason and Mitroff (1981) further define subclasses of *generalisation, classification, cause and effect, sign or symptom, parallel case* and *analogy.* In general, substantive arguments are characterised by the fact that the warrant concerns the way in which one class of things X is related to another class Y. A number of observations O_i are assumed to form the data.
- *Authoritative* which rely on the authority of the source. Mason and Mitroff (1981) suggest that the credential of the source must be further backed in one of the following ways: *expertise, method, consensus, tradition* or *basic belief.*
- *Motivational* which appeal to the values of the audience.

Backing are additional statements in support of the warrant. Practice has shown that it is not easy to distinguish backing from warrants. For this reason, backing is often omitted from the model (Huff 1990).
Qualifiers give possible limitations to the claim.
Rebuttals represent conditions that further limit the scope of the argument.
Arguments can be chained. The claim of one argument may become the grounds or warrant for the next.

Mitroff and Mason (1981) provide a quantitative way of handling arguments through *plausibility analysis.* In their definition, plausibility refers to the *credibility* of an argument - how believable it is or how much sense it makes to a person. In this sense, plausibility is very different from probability.

An example of presenting a strategic argument following Toulmin's model is given by Brönn, (1998). It concerns the newspaper industry and it is presented in Figure 5-13 :

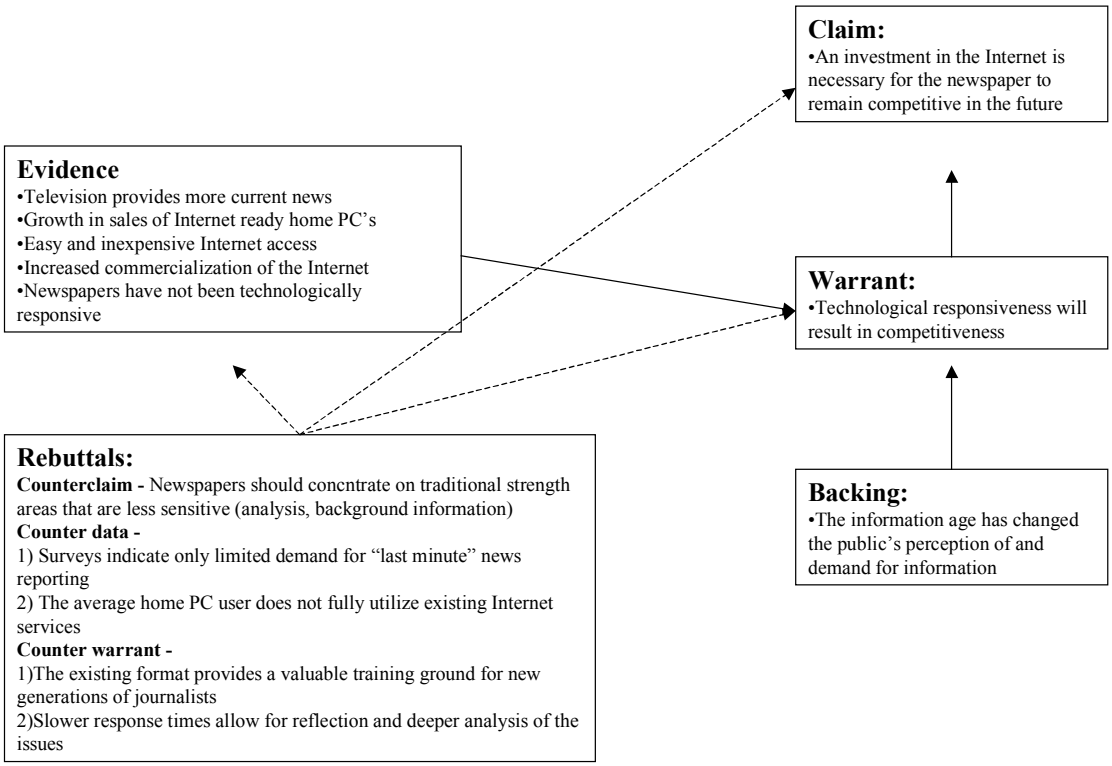


Figure 5-13 The Internet investment argument for a newspaper (Bronn (1998))

Building on Mason and Mitroff's work Brönn (1998) goes further on to show how epistemic logic could be applied to formalise the argument and how its plausibility could be evaluated.

5.7.5.3 Implications to This Research

Toulmin's model and ideas around it seem useful. Substantive arguments are interesting in the sense that they are expressed in terms of logic and thus offer a possibility to be expressed and handled in a computer. Testing of substantive arguments amounts to finding data in support or rebutting the claim as related by the warrant, or finding data supporting or rebutting the claim directly, or finding data rebutting the warrant.

Let us assume that a business strategy or a strategic action program is based on an argument and that the argument can be described following Toulmin's model. We could now be interested in following up the argument and to ascertain that it holds as new information is gathered over time. We are therefore interested to observe

1. That the new evidence supports (or counters) the claim (as reasoned by the warrant).
2. That the warrant (the logic) of the argument holds, i.e. is supported by new backing (or countering) information.
3. That the qualifiers remain appropriate

We may have additionally established a counter claim with its associated (counter) warrants and would thus be interested to observe any counter data.

It should be understood that, in the author's experience, in many cases the arguments are not conclusively presented in business plans. For instance, the warrants may not be explicitly expressed or elaborated on or scant evidence is offered in support of a claim. We may therefore have to assume that the strategies and action programs in a business plan are based on just the claims in the plan rather than on the warrants. Alternatively one would have to follow the procedures suggested by Mason and Mitroff (1981) for uncovering the assumptions.

5.7.6 Narrative Semiotics

5.7.6.1 Description

Semiotics is a methodology for understanding the sequences and interactions of a belief system embodied in a written text or any other symbol system. A semiotic approach assumes that to understand the relationship between individuals and their environment, one must understand how those individuals structure the meaning of their world. It is further assumed that such meaning is always rooted in a set of oppositions (e.g., love has only meaning within the context love/hate). (Fiol 1990)

Narrative texts are considered to have three levels of structure:

1. Surface structure, which essentially is the string of words of text.
2. Deep structure, which defines the fundamental value or belief systems in a text.
3. Narrative structures, which represent the bridge between the surface and the deep structures. Narrative structures are developed by researchers in order to be able to derive the deep structure of the text.

In a semiotic analysis, text is broken down into sets of narrative blocks or programs. It is then analysed based on the following concepts.

The narrative structure of a text is defined by six forces called *actants* as presented in Figure 5-14.

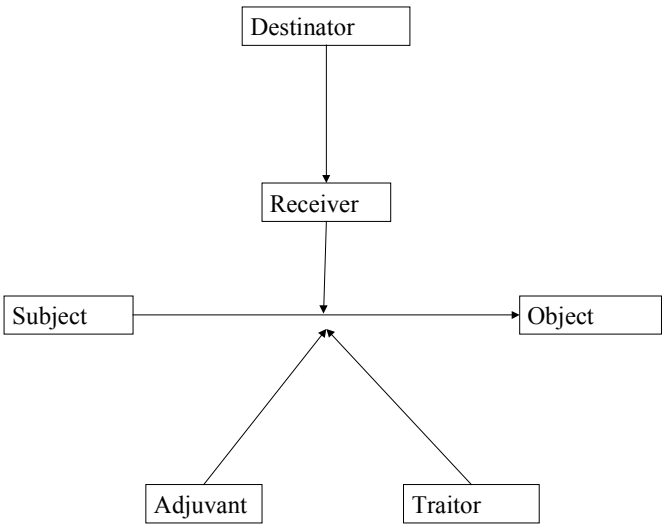


Figure 5-14 Actant relationships (Fiol (1990))

Destinator imposes the rules and values that are present in the text. *Receiver* receives the destinator's values. *Subject* carries out the central role of the narrative. *Object* is the desire of the subject, the goal toward which the subject's actions and reflections are directed. *Adjuvant* represents the forces that assist the subject in acquiring the object. *Traitor* represents the forces that prevent the subject from requiring the object. The destinator's rules are given to or imposed on the receiver. The subject is moving toward the object while positive and negative forces are acting on it. All of this happens within the destinator's sphere of influence.

Space and *time* are two other important influences. They create *isotopies*, or domains that significantly influence the behaviour of the actants.

1. *Spatial isotopy* is a categorisation of the environment. *Utopic* is the internal space in which the subject operates, and *heterotopic* is the external space including everything non-utopic.
2. *Time isotopy* is a categorisation of displacements that occur across time.

The *mode* of a narrative section is *pragmatic* if it describes an action. If the segment describes passive reflection, the mode is *cognitive.*

The actants may be presented as *associated* or *disassociated* with each other. The movements of the actants are traced. Movements can be *acquisition, confrontation, displacement, cognition, desire,* and *transformation*. The actants can *associate* or *disassociate* with other actants.

The *semiotic square* as depicted by Figure 5-15 is the central construct used in describing the deep structure. The square illustrates the atemporal logical relations of values in a text. It incorporates two types of opposition and two types of logical relations.

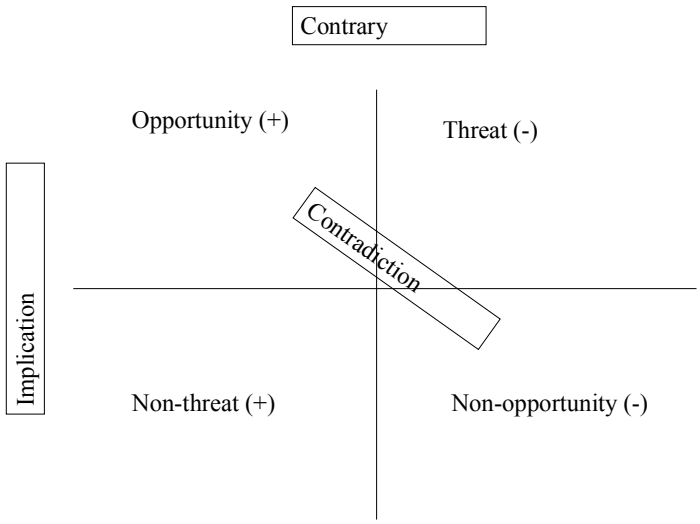


Figure 5-15 Semiotic square (Fiol (1990))

5.7.6.2 Implications to This Research

Whilst narrative semiotics seems to offer interesting ways to analyse strategic text and to uncover the deep structures in strategic thought too much effort and human interpretation seems to be required for the concepts to be useful in a modelling effort.

5.8 Computer Processing of Text

5.8.1 Introduction

In this section we will explore how text can be processed in a computer to understand the messages and facts conveyed in the text. We will consider two particular fields: content analysis and information extraction.

5.8.2 Content Analysis

5.8.2.1 Description

Content analysis has its roots in the hypothesis that the way in which people perceive the world is heavily influenced by the categories of their language. As Whorf (1942) claims every language is a vast pattern-system, different from others, in which are culturally ordained the forms and categories by which the personality not only communicates, but also analyses nature, notices or neglects types of relationship and phenomena, channels his reasoning, and builds the house of its consciousness.

Broadly speaking content analysis of messages can be applied to study the intentions and other characteristics of the source of the message, to the message itself and to the effects, intended or otherwise, of the message. With regard to statements issued in e.g. company reports this kind of broader study might be warranted. However, if we study reporting of a reliable source of business news we could restrict ourselves to studying the information of the message.

The following description of content analysis is largely based on Popping (2000). A seminal source of information on content analysis is Krippendorf (1980).

Content analysis has traditionally been associated with media and mass communication. In the context of our research we are interested in content that is in textual format. Popping (2000) defines text analysis, or content analysis, as encompassing a class of techniques for the social scientific study of communication. Central to the analysis is not the material, the visible, but the invisible: the world of meanings, values and norms made accessible by symbolic behaviour (language, literature, plastic art, and music).

Communication is understood as involving message, channel, audience, as well as source. These four aspects of communication represent the most common contextual variables used in the analysis of texts and transcripts.

Beyond examining symbolic content within various contexts, text analysis is used in bringing structure to an enormous amount of rather unstructured information. This allows the investigator to make explicit various aspects that might not be noticed by the lay observer.

Two approaches to analysis can be distinguished. In the *instrumental view* texts are interpreted according to the researchers theory and in the *representational view* texts are used as a means to understand the author's meaning.

Three main types of analysis can be distinguished. Traditional or *thematic text analysis* is based on the frequency of occurrence (and co-occurrence) of concepts or

thematic variables in text. These could highlight the importance of concepts at any one time or culture's changing over time.

In the *semantic analysis* not only the concepts are encoded but also the relations among the concepts. Semantic encoding entails creation and use of a *semantic grammar* (e.g a Subject-Verb-Object or a Subject-Valence-Verb-Object syntax). Semantically encoded data can be used to make inferences about the conditions under which texts' authors take specific positions on others' intentions.

Network text analysis extends semantic analysis. It is based on the observation that after one has encoded semantic links among concepts, one can proceed to construct networks of semantically linked concepts. When concepts are depicted as networks, one is afforded more information than the frequency at which specific concepts are linked in each block of text; one is also able to characterise the concepts and/or linkages according to their position in the network

There are two main methods of network analysis. *Cognitive mapping* involves extracting linguistic information from texts and then representing the "mental models" that individual sources had in their memory at the time the relations were expressed. Cognitive mapping is based on the assumptions that

- Mental models are internal (somewhat subjective) representations
- Linguistic expressions reveal mental models
- Mental models can be expressed as networks of concepts

After maps have been created it is, for instance, possible to compare maps of individuals and find similarities or differences between them.

The *network evaluation* method builds on the idea that every language has three kinds of words

- 'common meaning terms' for which a common evaluative exists (e.g. peace, enemy)
- 'attitude objects' which have no fixed evaluative meaning (e.g. a car)

- 'verbal connectors' that indicate the association or disassociation of attitude objects with common meaning terms or with other attitude objects (e.g. 'it is…' or 'it is not…)

By investigating how attitude objects are associated or disassociated one can investigate how these objects are valued in a text.

Text or context analysis relies to a large extent in human intervention in the design of the instrumentation, in the encoding of the text and in the interpretation of the results. This affects both the reliability and the validity of the results.

5.8.2.2 Computer Support of Content Analysis

Numerous programs exist to assist in the analysis of text. E.g. Popping (2000) lists many and categorises them along the method (thematic, semantic, network) and the approach (instrumental, representational) dimensions.

The following site, http://www.intext.de/TEXTANAE.HTM, maintained by Harald Klein has good pointers to available software.

The software for text analysis is not easily applicable because it in general is not based on language and knowledge engineering. Additionally, the products typically address a subfield of the total field.

5.8.2.3 Implications to this Research

Our interest is a mixture of representational and instrumental approaches. It is representational when we are building knowledge about a domain. It is instrumental when we are looking for certain phenomena of interest in a domain.

Thematic and syntactic analyses are of interest in building knowledge about a domain. Network analysis is of interest in both knowledge accumulation and in observing phenomena.

5.8.3 Information Extraction

5.8.3.1 Description

Information extraction (IE) is the task of automatically picking up information of interest from an unconstrained text and creating a structured output of it. A typical information extraction system consists of three major phases, as illustrated in Figure 5-16 (Pazienza (1997), Seitsonen (1999)). First, the system tries to extract individual facts from the source text through local text analysis. Second, these individual pieces of information are integrated to produce larger entities in discourse analysis. Finally, the relevant facts are transformed to the required output format, the output template. Appelt and Israel (1999) provide a comprehensive account about the state of art.

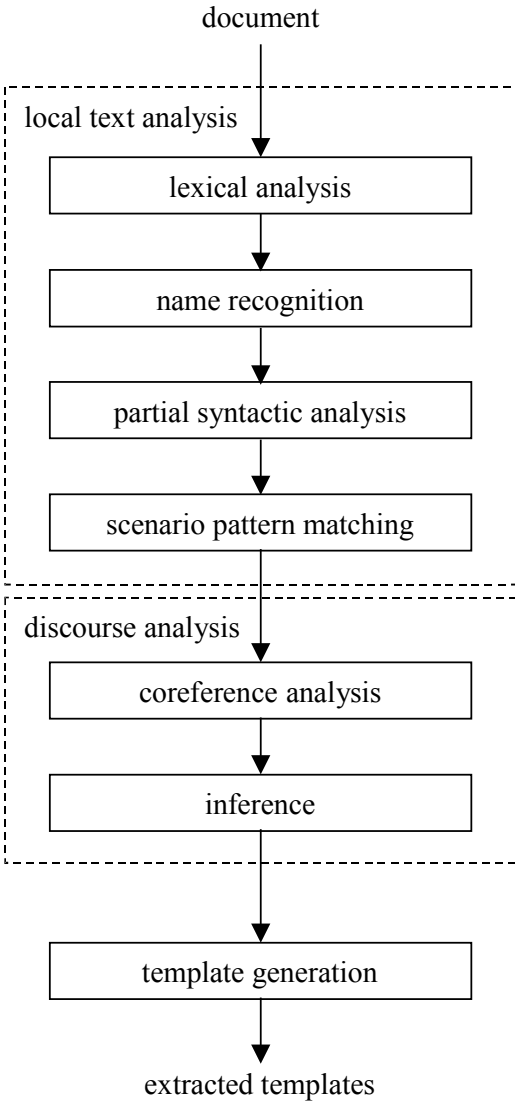


Figure 5-16 Structure of an Information Extraction System (Seitsonen (1999))

The Message Understanding Conferences (MUC), sponsored by the U.S. Navy and DARPA from 1991 to 1998, have been the primary drivers for the development of Information Extraction technology. The domains for the extraction tasks in the conferences have included terrorist attacks in Latin America, corporate joint ventures and microelectronics, negotiation of labour disputes and corporate management succession, and airplane crashes and rocket/missile launches (Yangarber (2001))

5.8.3.2 Implications to This Research

Information Extraction is particularly interesting to our research for two main reasons. First, it could help pick up specific important information from documents of unformatted text. Second, it assists in converting the extracted information into a structured format thus enabling further processing in a computer. IE will play a significant role in our construction. The reader will be exposed to the details of IE when we discuss our construction in Chapter 7 and our experiments in Chapter 8.

We have not come across research reports about how the results of some information extraction project would have been actually used or refined. We have not seen managerial evaluations about such use. This is what we intend to do.

5.9 Related Research

In this section we discuss some other related research to further position our own research.

Frank et al (1999) describe their effort to build a very large-scale knowledge base from a structured source, the Central Intelligence Agency's World Fact Book (WFB) which contains geographical, economic, and sociological facts about countries and territories of the world. The WFB version they used was annotated using the Standard Generalized Markup Language (SGML) which made about 60,000 facts available. The WFB text was converted and refined into a declarative knowledge base with an underlying formal ontology. To accomplish this transformation they built a customised parser to extract base facts from the WFB and an ontology of WFB concepts, relations and content. The outline of their system is shown in

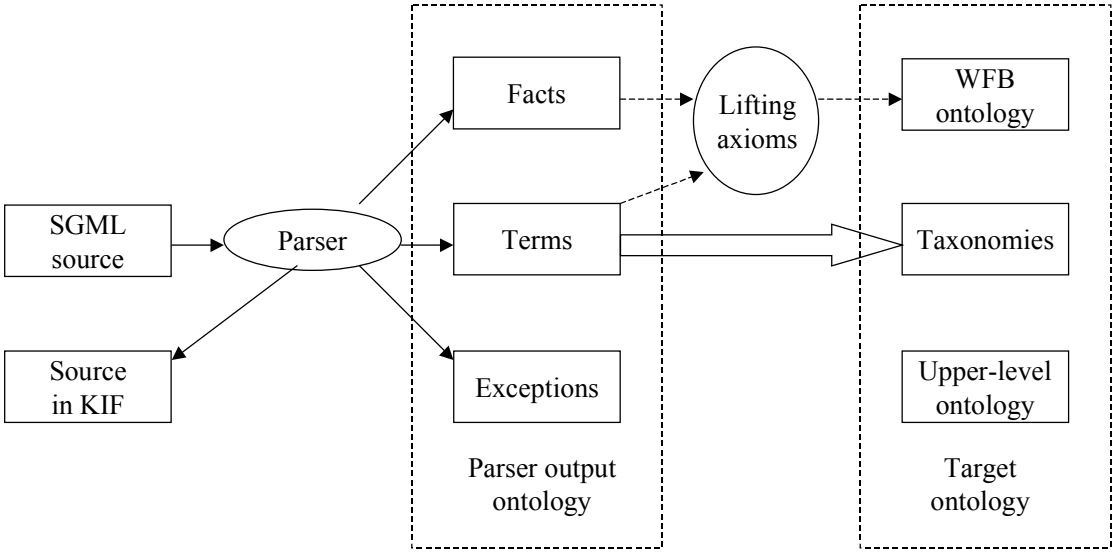


Figure 5-17 The WFB extraction process. Solid black arrows indicate parsing. The block arrow from "Terms" to "Taxonomies" indicates the manual construction of taxonomies from flat lists of terms. Dashed arrows indicate runtime information flow. (Frank et al (1999))

The extraction process was greatly assisted by two facts: First, the WFB is a semistructured source. Every country is presented using the same structure of topics. Second, the structure was made visible by the SGML annotation.

Annotated input material based on some dialect of XML (Extensible Markup Language), e.g. NewsML, is becoming increasingly available as the implementation of the Semantic Web spreads. This obviously assists in the knowledge extraction process. Our position, however, is not to require annotated input for two reasons. The first is that there will probably always be important text that is not annotated. The second, and perhaps even more important is that we claim that the dialect of the mark-up language deployed represents a view of the world and the annotation of a text using it an interpretation of the text in the light of it. It may sometimes be necessary to take an alternate, hopefully unbiased, view. On the other hand, we admit that our system should be developed to make use of existing annotations were deemed of assistance.

Staab et al. (2001) report on work done at the University of Karlsruhe and Ontoprise GmbH. In particular they describe CHAR, a knowledge management system for corporate history analysis. The kinds of questions CHAR is designed to answer are

illustrated in Table 5-5. Maedche and Staab (2000) also report on mining ontologies from text.

Table 5-5 Sample competency questionnaire for a business strategy in the chemical industry (Staab et al. (2001))

Domain: Business strategy in the chemical industry
Date: 2000/11/26
Ontology Engineer: T. Model

CQ no.	Competency questions	Concepts	Relation
CQ1	What are the subsidiaries, divisions and locations of company X?	company, subsidiary, division, location	company *has* subsidiary company *has* division company *has* location
CQ2	Which companies acquired company X?	company, acquisition	company *makes* acquisition acquisition *has* buyer acquisition *has* seller
CQ3	Which companies merged in 1990 in the rubber industry?	company, merger, year, industry	company *makes* merger company *isPartOf* industry merger *happensIn* year
CQ4	Who is CEO of company X?	CEO, company	company *has* CEO
CQ5	Which activity of company X leads to operation in region Y?	activity, company, operation, region	company *performs* activity activity *leadsTo* operation operation *takesPlaceIn* region
CQ6	Is there any regional expansion of company X due to the acquisition of company Y?	expansion, company, region, acquisition	company *makes* expansion company *makes* acquisition expansion *takesPlaceIn* region
CQ7	...		

The German research is, to our knowledge, closest to ours in terms of making use of language technology. Their technical solutions are advanced. They have also paid attention to developing general knowledge engineering methodologies.

Where we differ is that our focus is on creating management support for strategy work. We want primarily to deal with managers and their requirements, not with knowledge experts. We not only address the question "how to extract information?" but additionally "can we refine the extracted information for useful purposes, i.e. what to do with it?". The desired competencies expressed by our managers go beyond those shown in Table 5-5. They want prognosis not just analysis. They want to be alerted.

Advanced Knowledge Technologies (AKT) is an ambitious multi-million pound six-year research effort in the UK (http://www.aktors.org/). The mission of the Advanced Knowledge Technologies consortium is "to identify where we can, and invent where we must, the next generation of technologies for organisations to create, manage and extract value from their knowledge assets, and to integrate these technologies to show a complete approach to the knowledge life cycle." Many of the activities of the AKT consortium seem to be related to business processes. However, the author has not been able to identify any activities related to the field of business strategy.

Related research has thus been actively going on in many fields. These fields include, in addition to knowledge management, language technology, decision support systems and so on. Significant advances have been made in the development of the realisation of the Semantic Web. However, such research has been concentrating in developing the technologies as such but the evaluation of the applications and the evaluation of the reactions of the potential users to the emerging possibilities seem to have been left to the market forces. Additionally, many knowledge applications being built seem to be aiming for supporting the operational aspects of business, such as electronic commerce or customer relationship management, rather than the strategic aspects of business. Therein lies our potential contribution: in support for strategy work and user considerations.

5.10 Summary

In this chapter, to answer our first research question about the existence of tools, we have searched and found a number of tools and techniques that might be useful in strategy work. How do they meet the requirements we have identified and what the implications to our research are?

A large number of useful analytic and supporting tools do exist. Useful tools for supporting the business and competitive intelligence processes are emerging, too. Sources of digital information are improving through the Internet and the Semantic Web. Tools for supporting content analysis also exist. However, few, if any, of the tools reviewed in this chapter address the requirements identified in the previous chapter. They do not seem to address flexibility and tolerance. Considering a holistic strategy support system there are thus several problems with the tools. These include:

- They solve or assist in solving fragmented, partial problems
- They are non-compatible
- They may assume a particular strategic planning paradigm and not be flexible about it
- The models may require high level numeric input which involves constructs that may require human interpretation of reality
- They may be black boxes. The algorithms deployed may proprietary and not be publicly known, their properties are not necessarily understood by the users

- Using acquired information for further refinement is problematic, it needs human intervention

We are confident that increasingly useful information exists and will be legally accessible on the Internet. At the same time one has to be cognisant of the fact that not all information is there or it is not publicly accessible.

In the review process we did identify some interesting concepts and schemes that could be exploited in considering solutions for a strategy support system. These included *causal maps* (Section 5.7.4)*, strategic arguments* (Section 5.7.5)*, content analysis* (Section 5.8.2) and *information extraction* (Section 5.8.3). The implications of these to our research were considered under the corresponding headings in the appropriate sections of this chapter.

In the next two chapters, we turn our attention to the solutions.

6 Theoretical Considerations

Support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.

1. What kind of computer based tools exist to support strategy work?
2. Are the tools used?
3. Is there a need for the tools?
4. What are the requirements for the tools?
5. **What could be the solutions for the tools?**
6. Could partial and useful solutions be built?
7. What does management think about the partial solutions built and why?

6.1 Introduction

In the previous chapters we have covered the nature of strategy, the job of the strategist and touched on the issues related to acquiring data and refining it into information and knowledge. A key issue that emerged is the *support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.* This entailed

1. Flexibility for accommodating changes in the environment and in the attention of business
2. Flexibility for changing strategic paradigms, to allow for deployment of new concepts in strategy
3. Flexibility in bringing a rich and open set of data into a decision making situation
4. Tolerate masses of irrelevant data and arrive at the best capta, set of relevant data
5. Tolerate incomplete and inaccurate data
6. Tolerate and be flexible about the uncertainty of future outcomes, allow for the possibility of dynamic multiple futures
7. Tolerate and be flexible about differences in inquiring organisations
8. Accumulate timely and comprehensive information and manage dynamic knowledge
9. Process and synthesise multiple views in an unbiased way.

We assumed that the managers have two principal modes of working, hypotheses testing and inductive.

We also looked at some tools and found them lacking. We came across some potentially useful concepts and schemes.

In this chapter we deal with research question five "what could be the solutions for the tools?" We first consider some theoretical aspects and alternatives for a strategy

support system. We will then present some technical considerations and explain some architectural ideas.

Our central tenet from now on is that important and relevant information regarding our domain of interest - strategic business plans and events in the business environment - is available in textual format and can be processed by a computer. We believe that by that making judicious use of textual information the requirements of flexibility and tolerance which we have identified, can be met to the satisfaction of the potential users. Textual material, if prudently selected, may allow us to capture the dynamics of the world in terms of changes in the business environment and even in business people's emphases.

6.2 System Architectures

6.2.1 Introduction

An ideal business planning support system, in our thoughts, should strive to

- support the user in the creation of business plans
- create intelligent models of the business as reflected in the business plan
- connect such plans to business and competitive data on-line in order to enable the plans 1) to follow-up events in the business environment and 2) to judge the continued validity of the plans. In order to infer anything the data has to be expressed in machine understandable format, in essence modelled, too and in so doing meet the requirements identified earlier.

Such ideal, utopic, constructs could be called "Business Plans That Think" (BPTT).

We have considered two possible architectures and have realised parts of a third one:

1. An unstructured architecture that would impose little formalism and structure on the user
2. A structured architecture that would impose more formalism but at the same time trying to hide it from the user
3. An architecture for a partial system that concentrates on the intelligence gathering and evaluation

6.2.2 Unstructured Architecture

A finding of the study reported in Säkkinen and Virtanen (1997) was that quite a few people participate in the strategy planning process in many companies. This is an important consideration for any system intending to support strategy work. The planners are busy managers most of them not proficient in information technology. The conclusion that can be made is that it is not reasonable to expect that the business planners would be used to working with computer based planning systems requiring a fair degree of formalism. Based on this and partly based on the advice of some practising companies we came to the idea that it is important to not to require companies to have to change their current planning paradigms in order to start to use new planning tools. It would be important to preserve the freedom of the planners and let the planners plan and document their plans as they see best in their current situation. There should be no or little new requirements placed on the format of the business plans for example.

To create “business plans that think” many things are required. A common language is needed which defines the concepts discussed in a business plan. Business plans need to be turned into structured models incorporating the concepts defined in the common language. These structured models define the business and its environment as described in the business plan. They also define the types of information desired in order to be able to verify and ensure the continued validity and utility of the plan. The business environment needs to be scanned for the information. The information acquired has to be analysed for its significance and consequences need to be pondered. The results should be presented in a powerful way.

To facilitate the creation and architecture of a system meeting the requirements above one could envisage two levels of ambition which can eventually be coexistent and co-operative. At the lower level the user, the business planner, plays a major control and even a processing role. Plans are structured with the assistance of the user. Business intelligence information as specified by the user is gathered and pre-processed by the system but will not be deeply digested before it is handed over to the planner for further consideration. This level is here called the *computer assisted planning support (CAPS)* level. This is the manual "pilot-in-control” level. One could also call this level

the *reactive level* since the emphasis is more in understanding what has transpired rather than predicting the future. At the CAPS level information can be collected and focused at specific points in the business plan where older information about the topic has been used and it is up to the user to make the conclusions.

A schematic presentation of the CAPS level scheme is in Figure 6-1 The main blocks needed to create the targeted business planning and modelling environment are considered to consist of

1. An Ontology (see e.g. Sowa (2000)) that defines the concepts and relations that are associated with business planning and business plans.
2. A Plan Manager program which supports the business planner and manages the planning process and associated tasks.
3. A Parser program which assists the business planner in structuring and preparing a plan for further processing. The line of thought that the current planning paradigm in a company should be altered as little as possible leads to the idea that it should be possible to take a business plan as currently created in a company and use it as the basis for subsequent modelling. The role of the Parser would then be to take the existing plan and split it into logically meaningful parts, in other words to create a structured format of the plan using the concepts defined in the Ontology. In the parsing process also the information interests of the various parts of the plan would be established.
4. A Connector program which links a structured plan to sources of business intelligence and includes mechanisms for acquiring business intelligence via intelligent agents.
5. An Analyser program which pre-processes the intelligence gathered and funnels the information to the appropriate parts of a plan.
6. Presentation of results in virtual reality. Presentation of results was deemed crucial in this kind of system. Thus came the idea of the Virtual Planning Room. (This idea was decided to be beyond the scope and the resources of the project, however).

CAPS LEVEL *(Information support,* *reactive level)*
ONTOLOGY
PLAN MANAGER
PARSER Structured Plan Format Information Queries
CONNECTOR Spawning of Agents Launching Agents into Net
ANALYSER Classification of Information (with Help of Neural Nets) Summaries of Information Focus Information on Plan Topics and Items
PRESENTATION OF RESULTS IN VIRTUAL PLANNING ROOM

Figure 6-1 Computer Assisted Planning Support (CAPS)

On the higher level of support computer models would play a major role in processing the business intelligence collected. The input to be provided to the user will have been deep analysed by the modelling system (an advanced version of the Parser). This level is called the *computer model assisted planning support (COMAPS)* level. This is the simulated "auto-pilot level". This level could also be called the *proactive level* since alternative scenarios about the future can be presented. Figure 6-2 presents the structure of the CAPS level schema. Simulation models of business would be used to evaluate alternative options. The models will accumulate knowledge and will be the main components in eventually forming the basis for "thinking" at the COMAPS level. At the COMAPS level new information could be used to rerun the simulation models with new data thus indicating what the impact of new developments might be. At the COMAPS level new information could also be used to change the structure of the models describing either the business environment or the business itself. This would be tantamount to testing the impact of significant changes in the business environment or the effect of alternate strategies.

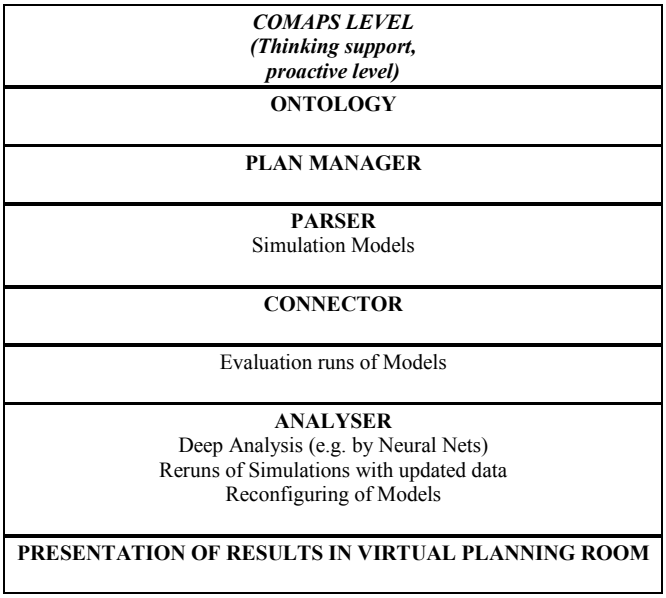


Figure 6-2 Computer Model Assisted Planning Support (COMAPS)

Figure 6-3 brings the two levels of support together into a holistic architecture.

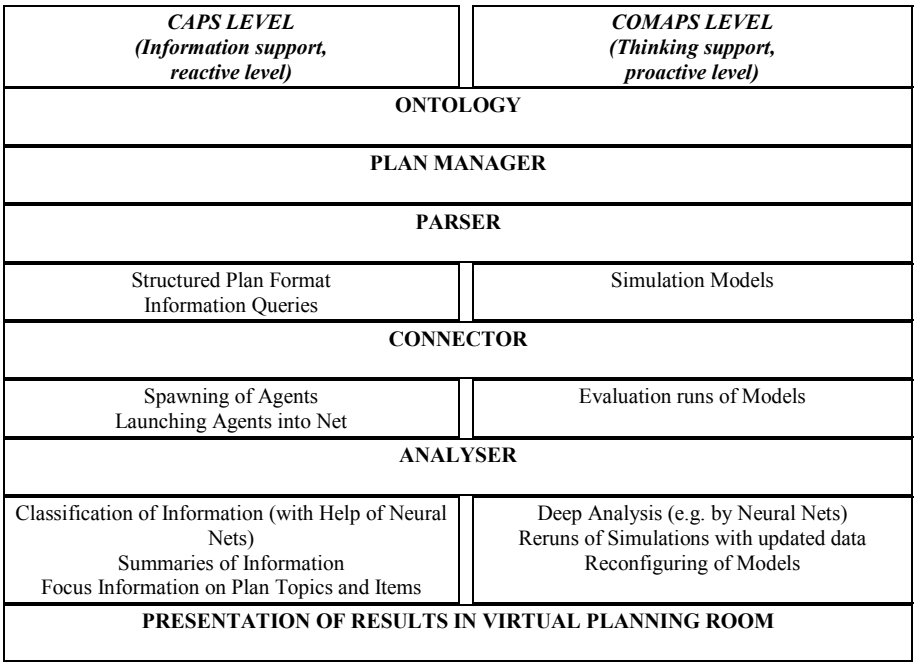


Figure 6-3 The Unstructured Architecture

6.2.3 Structured Architecture

A more structured architecture is depicted in Figure 6-4

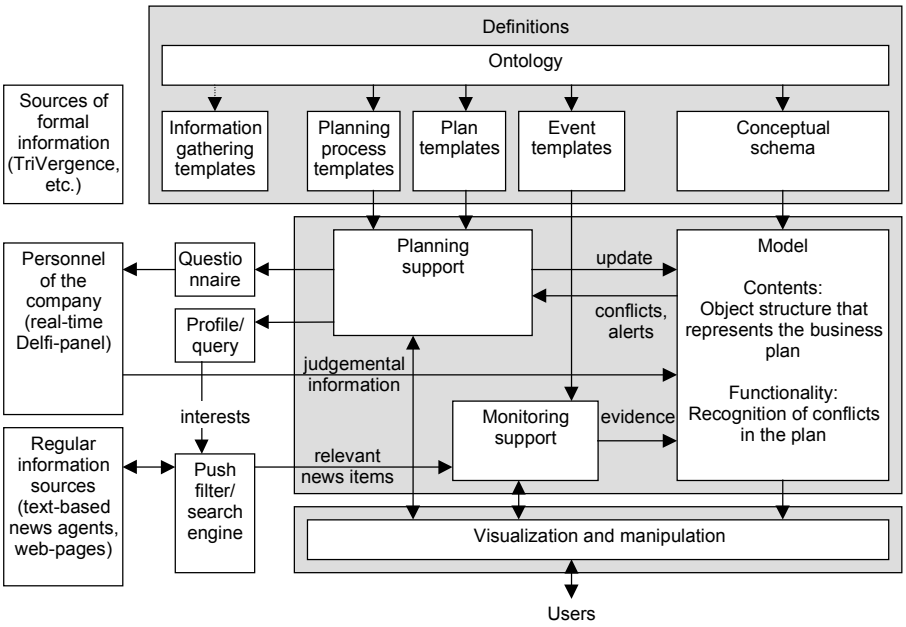


Figure 6-4 The Structured Architecture

In this scheme the business plans would be entered through structured templates using the Planning Support function. These templates would represent aspects of plans in the planner's terms and would be subsequently translated to models expressed in the terms of the Ontology. Similarly, items of business intelligence would be analysed with the help of the Monitoring Support function. A business intelligence person would model information in the news items with the aid of the event templates. The plan models would then be able to analyse information from the event templates and recognise arising conflicts in the plan.

The modelling exercise would also result in a profile being created of the plan. This profile would direct and assist in gathering information that is potentially relevant to the plan. It was thought that information could come from regular information sources, from structured information sources and from informal information sources such as a company's own personnel.

6.2.4 Ontology and Knowledge Base

Ontology is at the centre of both of the architectures presented. According to Guarino et al. (1995), *ontology* can be understood as an intensional semantic structure which encodes the implicit rules constraining the structure of a piece of reality. Ontologies are aimed at answering the question “What kinds of objects exist in one or another

domain of the real world and how are they interrelated?". An ontology thus describes the logical structure of a domain, its concepts and the relations between them.

An ontology, as understood here, provides the basic structure or armature around which a knowledge base can be built. An ontology provides a set of concepts and terms for describing some domain, while a knowledge base uses those terms to represent what is true about some real or hypothetical world. (Swartout and Tate (1999)).

As ontologies represent conceptualisations of a domain, i.e. they describe the world, there can be differences between them. As an example of the analysis of the most general concepts Chandrasekaran et al (1999) show in Figure 6-5 the differences between some four well-known ontologies CYC[8], GUM[9], Wordnet[10] and Sowa's T[11]. Since the drawing of this picture at least Sowa's and CYC's analyses have changed somewhat (Sowa (2000)).

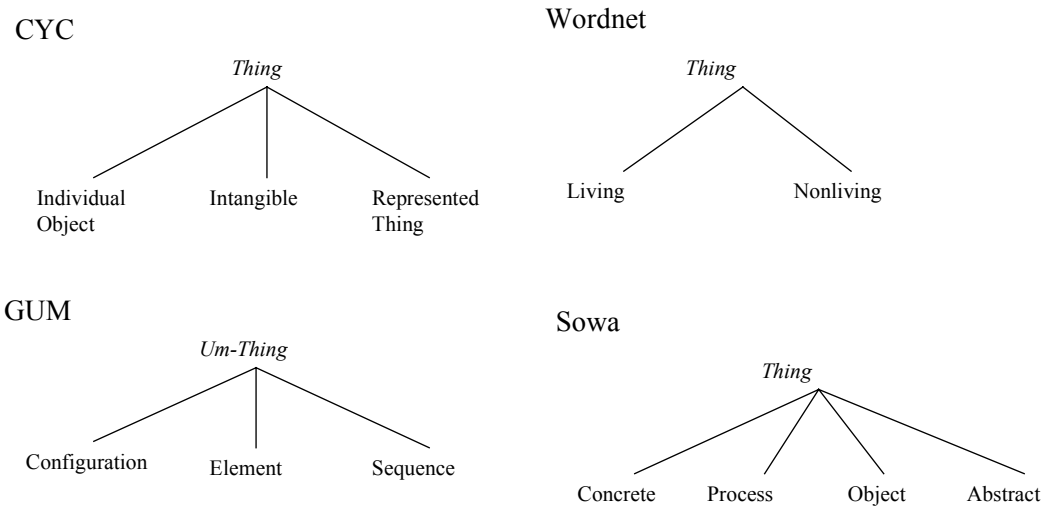


Figure 6-5 Illustration of how ontologies differ in their analysis of the most general concepts (Chandrasekaran et al (1999))

[8] www.cyc.com

[9] http://www.darmstadt.gmd.de/publish/komet/gen-um/newUM.html

[10] http://www.cogsci.princeton.edu/~wn/

[11] http://www.jfsowa.com/ontology/index.htm

According to Chandrasekaran et al (1999) general agreement, however, exists on many issues:

- There are *objects* in the world.
- Objects have *properties* or *attributes* that can take *values.*
- Objects exist in various *relations* with each other
- Properties and relations can change over *time.*
- There are *events* that occur at different *time instants.*
- There are *processes* in which objects participate and occur over time
- The world and its objects can be in different *states.*
- Events can *cause* other events or states as *effects.*
- Objects can have *parts.*

At the time this research was young there existed two formal ontologies that dealt with the higher-level business concepts. They are the Enterprise ontology from University of Edinburgh[12] (Uschold et at (1998)) and TOVE (Toronto Virtual Enterprise) (Fox and Gruninger (1998)) from University of Toronto[13]. After study of these ontologies we decided that it was not straightforward to increment them with the concepts we had in mind. We therefore made an effort to create a BPTT Ontology from scratch as reported in Törmä and Keijola (1999).

The research at the University of Karlsruhe has recently culminated in KAON[14] which is an open-source ontology management infrastructure targeted for business applications. It includes a comprehensive tool suite allowing easy ontology creation and management, as well as building ontology-based applications. An important focus of KAON is on integrating traditional technologies for ontology management and application with those used in business applications, such as relational databases. So far we have not seen any high level ontologies such as the Enterprise ontology.

Two big concerns with regard to the Ontology were brought up in our own ontology exercise. First, how to take into consideration and allow for the dynamical nature of

[12] www.aiai.ed.ac.uk/~entprise/enterprise

[13] www.ie.utoronto.ca/EIL/tove

[14] http://kaon.semanticweb.org , accessed on 2002-11-15

businesses both in the Ontology itself and in the models based on the Ontology. New business concepts would arise, old ones die, and existing ones could get new interpretations. For instance, what is included in telecommunications is different today compared to, say, ten or fifteen years ago, and can be different again in five years time. Individual companies may have individual definitions about the same concept. Second, how to handle both the uncertainty and the impreciseness prevalent in business information and business plans in the Ontology and the models.

The concerns, if unresolved, seem to preclude the viability of few general domain ontologies and may lead to a multitude of very specific task/sub-domain ontologies. The BRIEFS System to be described in Chapter 7 explores this route in a small way.

6.3 Business Hypotheses

6.3.1 The Idea of a Business Hypothesis

A business plan is a complex construct, especially to the computer. It can be built in many ways, its contents vary in scope and depth and so on. To test a complete plan for its integrity and success is far beyond the current capabilities of computers and information systems. In search for simplifications the idea of business hypothesis testing has been conceived of. We discuss in this section some theoretical considerations regarding them. The presentation is brief. A more complete treatment can be found in Keijola (1999)

It is thought that in general a business plan can essentially be considered to be a collection of (logically related) arguments or hypotheses or beliefs or assumptions about the business and its future (hereinafter called hypotheses). If any of the hypotheses can be proven wrong, or not applicable any more, then the validity of the whole plan would be suspect and thus the plan should be reviewed. Moreover, it has been thought that this line of thought would have wider consequences for both business planning and the follow-up of plans. A particular hypothesis could be relevant in a number of businesses and a single test in turn could serve a number of hypotheses as shown in Figure 6-6. If this could be realised in practice it would have implications on how business intelligence and strategic planning activities should be

organised in companies or at least on how and why the planners of different businesses should communicate between themselves.

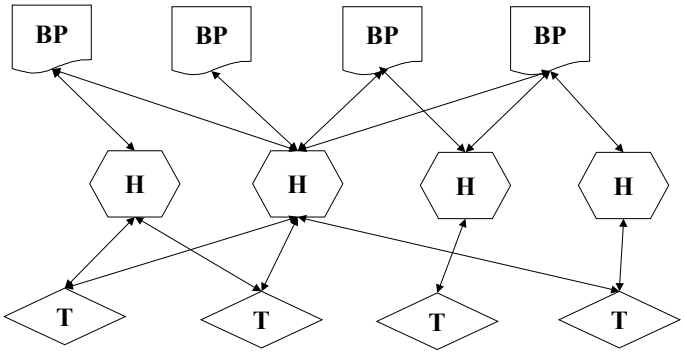


Figure 6-6 Multiple business plans (BP), hypotheses (H) and tests (T)

Testing the continued validity of the hypotheses of a business is the essence of strategic follow-up. The basic questions to be continuously revisited and answered are:

1. Is the strategy based on correct and valid assumptions and hypotheses?
2. Is the strategy working?

Webster's Compact Dictionary (1987) defines a hypothesis as "an assumption made in order to test its consequences". The Oxford Dictionary (1964) defines a hypothesis as "supposition made as basis for reasoning, without assumption of its truth, or as starting point for investigation; groundless assumption". A *business hypothesis* is here defined as a strategically important statement or assumption about the business or its environment. Mason and Mitroff (1981) state that "… a strategy may always be thought of as a set of assumptions about the current and future behaviour of an organisations stakeholders". We are talking here primarily about *expectations for the future* and not so much about events of the past or even the present. A business hypothesis which represents assumptions about the future may be confirmed or rejected not only because reality may eventually prove the hypothesis right or wrong, but also - and importantly - because the *belief* of experts (the managers) *in the hypothesis* ever turning true becomes very high or very low.

The main idea with the hypotheses is that they are "stakes in the ground", points of reference that can be used to better navigate the future. In essence they represent the management's best scenario for the future. This scenario needs to be continually or at

least periodically reviewed and revised. As Mason and Mitroff (1981) put it, assumptions have a half-life.

The hypotheses can be explicit or implicit. The hypotheses are regarded explicit when they are clearly stated in a business plan. Implicit hypotheses are those where no explicit statement can be found in a plan linking individual statements to form a hypothesis. For example an action program might have been established to serve the achievement of a particular strategic goal, but this linkage has not necessarily been specifically stated in the plan (though maybe it should have been). In the following sections mainly the explicit types of hypotheses are considered.

In practice one would assume that a number of key hypotheses, "big bets", important strategic issues, have been defined for close follow-up because they represent important assumptions for the future and because significant action programs (hypotheses in themselves) are based on these assumptions.

The fact that a hypothesis is subject to rejection does not necessarily mean that the plans embodying it will become obsolete. However, such plans may have to be thoroughly reviewed and maybe the key hypotheses have to be revised or some alternative hypotheses developed.

6.3.2 Categories and Testing of Hypotheses

Some categories of hypotheses are now defined and discussed in the following. For a more complete treatment see Keijola (1999) For each category we first define it, then give examples of typical hypotheses and then discuss how the hypotheses could be tested by experts (initially human, later, maybe, computer).

6.3.2.1 Monolithic Propositions

6.3.2.1.1 x is true (at time t)

This, the simplest, type of hypothesis presents a statement, x which may be true or not true at time t. In the Fletcher and Huff (1990) terminology of different types of claims in arguments this would classify as a designative claim.

The statements often relate to the existence or non-existence of *states of affairs* regarding one or several business entities, or *events* regarding one or several entities.
The statements can be simple or rather complex. A key consideration here is that the statement is treated as a monolithic whole and no attempt to break it down to its constituent parts is made. In terms of Toulmin's argument model we are considering stand-alone claims and not specifying how data, warrants etc. might be related to it.
We have chosen to use the preposition "at" for time instead of "on", "in" or "by" in the basic form of the hypothesis. However, it is recognised that these other prepositions are also relevant with regard to time. They can, however, be handled by significance intervals as will be discussed later in this chapter.

Examples of hypotheses:

1. Microsoft will acquire Motorola at 1.1.2005. (An event will take place).
2. 30% of all new energy plants will be based on fuel-cell technology in the year 2004 (UOW (1997)). (A state of affairs).
3. IBM is the largest company in the IT sector in year 2005. (A state of affairs)

Testing of hypotheses:

We assume in the following that we have indeed made some strategic plans that are based on the event that some of the hypotheses above are becoming true.
To test this type of hypothesis we need significant cognitive capabilities from those performing the testing since we have not attempted to break the hypothesis into parts. This type of hypothesis could best be tested by posing the question "is x going to be true at time t?" to some human experts. The experts' answers to the question would reflect their *belief* in the expected state of affairs becoming true, or belief in the expected events taking place. The answers might take the form of simple "yes" or "no". More qualified answers like "almost" or "yes and more" or "don't have enough information", however, could be expected in practice. Or the answer could be to a slightly modified version of the original statement, e.g. "yes, however not before year 2000 but just after, in the first quarter of 2001".
The answers should be given and interpreted in relation to the strategy the hypothesis is part of. The objective of testing the hypotheses is to determine whether the chosen strategy is essentially still valid, or whether it should be revised. Thus a more accurate way to pose the question to the experts is "is the situation described by the hypothesis likely to be as envisaged in the strategy or is it (strategically) significantly different or is not feasible to infer either?" Yet in other words: "is x going to be true at time t or if

not (exactly true) is the difference *not* significant from the strategic point of view?" If the answer is "no" to both parts of the question, then the hypothesis should be rejected and the associated plan should be revised. If the answer to either part of the modified question is "yes", then the hypothesis should not be rejected, rather it should be considered confirmed. (If the difference is big but it is not considered strategically significant then the hypothesis should not have been selected for a follow-up in the first place.) If the answer is "cannot say", then it may be advisable to consider the development of alternative hypotheses. The following decision table, Table 6-1, illustrates the decision making rules. The first two columns define the conditions and the remaining columns the actions to be taken if the conditions apply. The time dimension is not considered here.

Table 6-1 Decision table for monolithic hypotheses. (F= False, T= True, Y= Yes, N= No, ?= Cannot say, - = not meaningful)

Belief in truth of hypothesis	**Deviation is *not* significant from strategy**	**Confirm hypo-thesis**	**Reject hypothesis, review plans**	**Develop alternative hypotheses and plans**	**Continue follow-up of original hypothesis**
F	F	N	Y	N	N
F	T	Y	N	N	Y
T	-	Y	N	N	Y
?	-	N	N	Y	Y

Time intervals:

To add consideration with regard to time, and to cater for the variation and impreciseness in the time dimension, *significance intervals* with regard to time could be established when a hypothesis is being defined for follow-up. For example three significance intervals are defined here:

Confirmation interval: if the expected state of affairs, or the events described in the hypothesis are believed to fall within the confirmation interval then the hypothesis can be fully confirmed.

Rejection interval: if the expected state of affairs, or the events described in the hypothesis are believed to fall in a rejection interval then the hypothesis should be rejected.

No decision interval: if the expected state of affairs, or the events described in the hypothesis are believed to fall outside the confirmation or the rejection intervals then the hypothesis cannot be rejected or confirmed. Alternative hypotheses should be considered in such a case.
We have chosen not to assign probabilities for the hypotheses to become true. Rather we are forcing the experts to take a stand for or against. The reason for this is that we are interested mainly in the question "should the strategic plan be updated or not due to changed circumstances affecting the beliefs and assumptions in the plan". We are looking for "reasonable doubt" in the minds of the experts.

Compared to Mason and Mitroff's (1981) plausibility analysis we are not offering as many choices for the plausibility rating (they offer ten choices) and we have introduced a dynamic aspect through the significance interval.

6.3.2.2 Statements about an Entity with a Single Measure

6.3.2.2.1 x is n (at time t)

This type of hypothesis differs from the previous one in that it has a definite internal structure. It is therefore a better candidate for computer analysis. In the Fletcher and Huff (1990) terminology this would be classified as an evaluative claim. The format is

x is n at t, where

x is a well-defined entity (having a generally accepted definition and generally accepted ways to measure it. Strictly speaking, it is an object that can be expressed in terms defined in an ontology)

n is a numeric value of a measure used to measure x

t is a point in time when it is true that x is n (optional).

The hypotheses in this category are assumed to relate to an absolute state of affairs rather than to a relative state of affairs. In other words the values involved in the hypotheses reflect directly measurable properties of the entity in question.
In terms of Toulmin's argument model this type of hypothesis has the property that the claim also defines what data is needed to support it.

Examples:

1. The national economy of China will grow by 3.6% in year 2005 (An absolute state of affairs (with regard to growth):
   x: national economy of China
   n: growth measure of the economy = 3.6%
   t: 2005
2. The revenue of Motorola will be US$ 100 B in year 2005 (An absolute state of affairs):
   x: Motorola
   n: revenue measure = US$ 100 B
   t: 2005
3. Market share of Nokia in dual band mobile phones in China will be 50% in year 2005 (absolute state of affairs (with regard to market share))
   x: Nokia
   n: market share in dual band mobile phones in China = 50%
   t: 2005
4. Wholesale price of most popular mobile phone will drop below $5 in the US by year 2005 (an absolute state of affairs)
   x: Most popular mobile phone
   n: wholesale price < $5
   t: 2005

Testing:

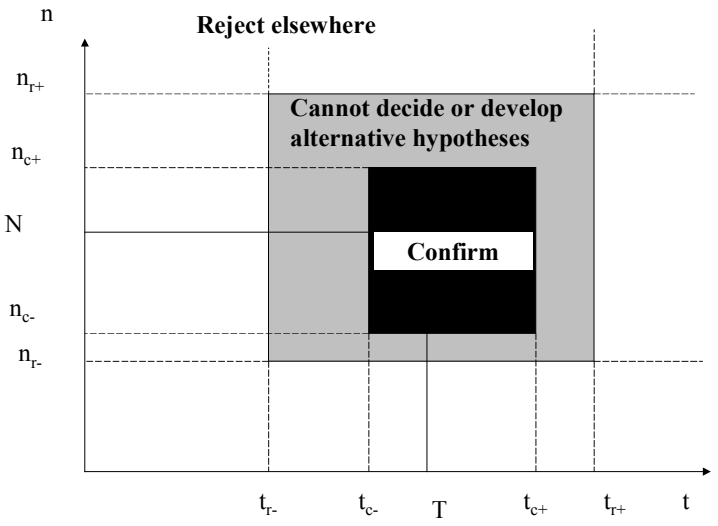
This type of hypothesis can be tested as follows.

1. Regarding example 1, by observing (a forecast of) "the national economy of China" and its forecast growth measure and noting its value in relation to 3.6%. The interesting question here is "what if the forecast growth value is 5.0% or 3.55% or 2.15%? Should the hypothesis be rejected in both cases or what should be the treatment?" To handle this question a *significance interval* could be associated with the measure. In this case, for instance, the intervals should relate possible deviations of growth from 3.6% to its strategic significance. For example a difference of less than +/- 0.3% might be considered not significant and the hypothesis should be regarded as confirmed; a difference of more than +/- 1.0% could be considered highly significant and the hypothesis should be rejected; and in other situations a decision cannot be reached. The significance intervals thus

allow for a range of possible values to be represented in a hypothesis. When a hypothesis is selected for follow-up then its definition should include a definition about the significance intervals. The simplest definition would again have three ranges: hypothesis confirmed, hypothesis rejected and no decision possible. A more sophisticated way would be to deploy "fuzzy statements" as shown e.g. by Carlsson and Fuller (2002).

2. Regarding example 2, by observing (a forecast of) Motorola and its revenue measure, and noting its value in relation to US$ 100 B. Again, the revenue forecast, or actually the observed revenue might be close enough to US$ 100 B so as to make no difference from the strategy point of view. Significantly higher revenues could point to a serious threat (and to a closing of an opportunity window) for some company and similarly a significantly lower value could remove a threat (and to open an opportunity window). Thus significance intervals with regard to value, as discussed in point 1 above, might be relevant here, too.
3. Regarding example 3, by observing (a forecast of) Nokia's market share for mobile phones in China and noting its value in relation to 50%. The message of this hypothesis might be that it is expected that Nokia will be a clear winner in mobile phones in China in the not too distant future. Thus significance intervals may be relevant for both the market share value and the time dimension.
4. Regarding example 4, by observing (a forecast of) the wholesale price of most popular mobile phones in the US and noting its value in relation to $5. Again, it is probably important to establish significance intervals for both the wholesale price and the time dimensions. For example the strategy might have to be reviewed if prices drop even lower than the forecast, or sooner than expected.

Significance intervals with regard to time were discussed in the Section 6.3.2.1. Similar intervals can also be introduced in the value measure dimension. The intervals with regard to the value measures and to time can be combined and summarised as in Figure 6-7. The dark area is where the hypothesis should be considered confirmed, in the grey area no decision can be made and elsewhere the hypothesis should be rejected. Again, more sophisticated schemes could be developed with fuzzy statements. On the other hand it is advisable to keep the scheme as simple as possible considering the decision to be made.



N, T are the original values in the hypothesis;
$t_{c-} < t < t_{c+}$ and
$n_{c-} < n < n_{c+}$ define the confirmation domain (black area);
$t < t_{r-}$, $t > t_{r+}$ and
$n < n_{r-}$, $n > n_{r+}$ define the rejection domain (white area)

Figure 6-7 Significance intervals for "x is n (at t)"

6.3.2.2.2 x is q (at t)

This type of hypothesis differs from the previous one in that q is a *qualitative*, non-numeric, measure of x. In terms of Fletcher and Huff (1990) this would classify as a definitive claim.

Examples:

1. Nokia is an innovative telecommunications company throughout the early 2000's (An absolute state of affairs).
2. Ericsson has the best Internet technology in year 2005 (A relative state of affairs).

Testing:

This type of hypotheses can be tested as follows.

1. By posing the question "is x q at t?" to some experts. Again, many of the considerations for relating the question to strategic significance presented earlier in Section 6.3.2.1 apply here.
2. Regarding example 1, by observing news reporting related to Nokia and focusing on discussions related to Nokia's capability for innovation, or observing news related to innovation and focusing on any evaluations related to Nokia's

capabilities. Lapses in Nokia's capability would make the hypothesis untrue provided that they can be regarded as strategically significant.

3. Regarding example 2, by observing news reporting related to Ericsson and noting evaluations related to its Internet technology, or observing news reporting related to Internet technology and focusing on any evaluations related to Ericsson's technology.

More complex hypotheses could be developed with multiple measures with Boolean relations.

6.3.2.3 Substantive Arguments

Hypotheses could be presented as substantive arguments (these were discussed in Section 5.7.5). The interesting characteristic of the substantive arguments is that they can be presented in logical terms. They are thus deemed to be worth exploring in more detail.

The testing of substantive arguments involves finding data to support or rebut the claim as related by the warrant, finding data supporting or rebutting the claim directly, or finding data rebutting the warrant. We are omitting the dynamic aspect in the following discussion for simplicity. However, in real life it should also be considered.

Two types of arguments are presented in the following as examples. For a more complete treatment see Keijola (1999)

6.3.2.3.1 Generalisation

The general form is

Data	X has O_1,O_2,O_3…O_n
Warrant	X is representative of a broader class Y
Claim	Thus Y has O_1,O_2,O_3…O_n

Examples:

1. Some pilot customers have expressed demand for a new product type A. Pilot customers are representative of a large group of potential customers. There is a wide demand for product type A.

2. Fuel cells have already been successfully tested in airport buses. New technologies take 20 years to penetrate in the heavy automotive vehicle industry. Fuel cells will form the basis for powering all new buses by the year 2010.

6.3.2.3.2 Sign or symptom

The general form is

Data	X has $O_1,O_2,O_3…O_n$
Warrant	$O_1,O_2,O_3…O_n$ are indicators of Y
Claim	Thus X has Y

Examples:

1. Electroforetic materials (e.g. electronic paper) are commonly discussed in research reports. When research reports about a technology are no longer presented in scientific journals and conferences, it may be a sign that the technology has entered serious commercialisation stage. Electroforetic materials are not yet at commercialisation stage.

6.3.3 Use of Experts in the Testing of Hypotheses

This section deals with how human experts could be used as evaluators of some simple hypotheses. The reason for this discussion is that it is instructive and may help in understanding how a computer-based process of analysis should be constructed.

Experts can have two roles:

1. They can pre-process, i.e., search, select, and evaluate evidence. They accept the evidence as relevant or reject evidence as irrelevant. They can also extract specific information required in testing a hypothesis from a large amount of information.
2. They can act as evaluators of a hypothesis. They answer direct questions posed to them.

6.3.3.1 Basic rules for evaluation

Some basic rules for evaluation can be considered:

1. Questions to be posed to the experts should be of the format "is the hypothesis true or if not exactly true, does it not make a difference from the strategy point of view?" If the answer is "no" to both parts of the question the strategy is no longer valid, if "yes" it is valid.

2. Significance intervals or distributions should accompany the measures and time.
3. An evaluator should also express an evaluation about the quality of data he/she has had to base his evaluation on.
4. The evaluation could be expressed as a decision matrix and decisions made based on the evaluation, e.g. as the simplistic example in Figure 6-8 shows.

Expert's opinion about the quality of evaluation base	High	**Reject hypothesis**	No decision or develop alternative hypotheses	**Confirm hypothesis**
	Medium	No decision	No decision	No decision
	Low	No decision	No decision	No decision
		Rejection proposed by experts	No decision proposed	Confirmation proposed by experts
		Expert's belief in hypothesis becoming true		

Figure 6-8 Reaching decision about a hypothesis, a simplistic decision matrix

A further idea would be to give the experts an opportunity to rephrase some types of hypotheses in such way, that they could express their belief with a higher degree of confidence. This means the expression of the hypothesis in such a way that it can be processed as a Delphi-like scheme. For example the experts could be allowed to redraw the time intervals and the significance distributions.

In the following we consider some examples of expert evaluations.

6.3.3.2 Examples of Expert Evaluations

Hypothesis: "The national economy of China will grow 3.6% in 2005".

Assume further that there is a strategic significance distribution for the growth value, but that such is not required in the time dimension:

Growth	**Significance**
3.4% - 3.8%	Right on, confirm hypothesis
3.0% - 4.1%	Possibly significant (downside, upside) strategic difference but cannot decide
otherwise	Significant strategic difference, reject hypothesis, revise

When a forecast about the growth comes in, it can be compared to the intervals and its potential impact to the strategy determined.

When an expert panel considers the evidence, then each individual expert member could make a proposal to redraw the boundaries of significance, and based on some rules (e.g. average, max or min and weighted by quality of evaluation base) a panelwide distribution could be redrawn. Note, however, that the hypothesis itself is not changed, only how the appropriate evidence should be interpreted.

Hypotheses: "Microsoft will introduce two major new Windows operating systems in 2005"

In this case we can assume that a significance distribution is needed also in the time dimension:

Number of versions	**Significance**
2	Right on, confirm hypothesis
1	Possible difference
0	Significant difference, reject hypothesis
Time	**Significance**
2005 + 6 months	Right on, accept
Otherwise	Significant difference, reject

When evidence about Microsoft's intentions become available, it can be compared to the intervals above and judgement can be made. A hypothesis should be rejected in total if rejection is suggested in any one of the dimensions.

Assuming a panel of experts is available, it can be used to redraw the significance distributions in a similar vein as in 6.3.3.2

6.3.4 Hypothesis template

An idea for a template for expressing and testing a hypothesis is now described. The templates are defined so that the business planners can express the hypotheses in a format that is conducive to computer processing. The template drives information extraction for the hypothesis, as well as gives direction to how it should be tested.

A hypothesis template has the following parts:

1. Type of hypothesis (each type may have a sub-template of its own)
2. The hypothesis as stated in the business plan
3. The components of the hypothesis and related values (for building the model)
4. Significance distributions for components
5. Method of evaluation (expert, neural, probability, fuzzy …)
6. Search and evidence reporting templates (for gathering and expressing evidence)

6.3.5 Processing of a sample hypothesis

In the following we assume that the evidence to be gathered for testing a hypothesis will be processed by a panel of experts. The expert is used to extract the exact evidence from the news items. He can change the intervals in a hypothesis.

Hypothesis: "National economy of China will grow by 3.6 % in 2005"

6.3.5.1 Hypothesis template:

Identification: Unique Id and version (there may be one or more instances of the template for each expert in the evaluation panel).

Time stamp:

Type: entity with single numeric value

Hypothesis in text format: "National economy of China will grow by 3.6 % in 2005"

Entity: National economy of China (maybe an entity class template opens here)

Measure: growth, Value = 3.6 %

Acceptance interval: >/= -0.3 %, =/< +0.4 %

Reject interval: </= -1.5%, =/> +2.0 %

Time: 2005

Accept interval: not active

Reject interval: not active

Method of evaluation: expert panel

6.3.5.2 Search template:

Identification of hypothesis

Search:

Target sources of information: list of URL, list of database

Keywords: "national economy of China", "growth", "2005"

6.3.5.3 Evidence reporting template:

Identification of hypothesis

Identification of evidence: Unique Id

Type of evidence: Value of measure of entity

Value of measure:

Time stamp:

Quality assessment: high, medium, low

Identification of source news item:

6.3.5.4 Processing of evidence

The search template will be used to guide the search processes.

When a news item is found through the search process it will be appended (via the evidence template) with a copy of the hypothesis template and sent to an expert.

The expert accepts or rejects the evidence as relevant. If he accepts he extracts the searched for value from the news item and inserts it in the evidence template. He also adds a quality of the information assessment. A time stamp is appended by the system and the original source noted.

The instance of evidence is stored in the evidence repository and the original news in the news repository.

The evidence is compared by the system with the acceptance intervals specified in the hypothesis template. The quality of evidence can also be taken into account. An alarm is raised if the evidence suggests rejection of the hypothesis. Experts whose evaluations cause the alarm to be raised are identified in the alarm.

Historical reports about evidence gathered can be produced from time to time. E.g. the values can be plotted against time.

Note that the expert can also produce evidence of his own (especially when specifically prompted by the system). In this case he just creates an instance of the

evidence template with a value of his own and specifies himself as the source of information.

6.3.5.5 Re-defining testing of a hypothesis

As the knowledge of the experts increases about a hypothesis they may want to redefine the acceptance and rejection intervals. To do so they may suggest new intervals by creating a new version of the instance of the hypothesis template assigned to them. Note that they cannot alter the basic hypothesis. The reason for this is that the hypothesis is written in at least one but possibly in several plans. To alter the hypothesis amounts to reviewing and rewriting the plan, and subsequently specifying the possibly altered hypothesis as a new one and possibly deleting the old one.
The experts could also alter the sources for search of information and the search criteria.

6.3.6 Hypothesis as a Cognitive Map

6.3.6.1 Developing a Map

Consider now that we have conceived of the following business hypothesis: "*Business Consultancy enables telecommunications company E to become an attractive development partner for new entrants into the cellular telecommunications operating and services industry and subsequently will take their implementation projects*". We call it here Hypothesis 14.

In this section we explore what is involved in developing a hypothesis into a construct that could be expressed and tested by an information system which is built to make use of cognitive maps (This was also treated in Keijola (1999)).

We start by first depicting the perceived business logic in the hypothesis as a cognitive map. The map, is shown below in Figure 6-9

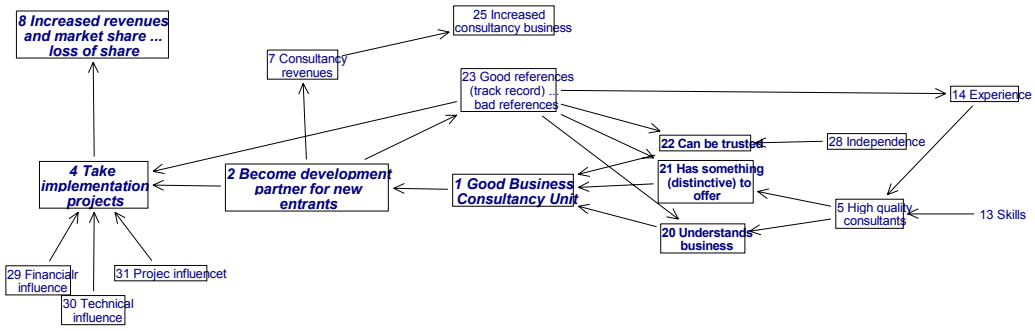


Figure 6-9 Cognitive map of Hypothesis 14. (The numbers have no significance here).

The next step is to refine the logic of the hypothesis as shown in Figure 6-10. The boxes represent events or states of affairs. The arrows represent influences between the events that mean the dependence between the likelihood of the occurrence of the related events or states. Cognitive maps thus can be defined as directed graphs with

1. nodes: states of affair
2. arcs: causal influences between the states of affair.

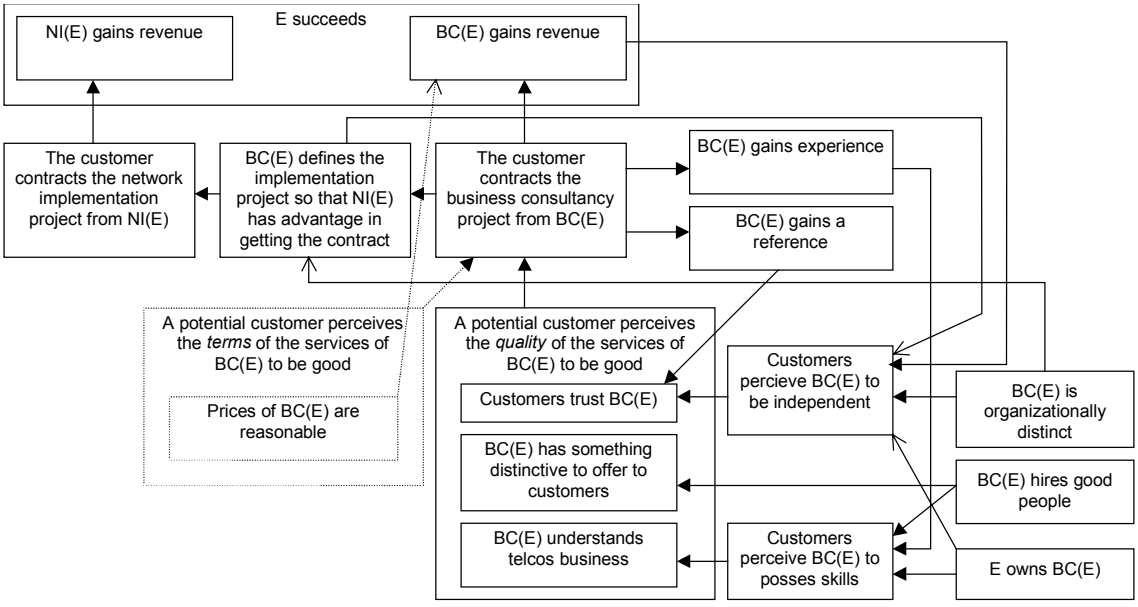


Figure 6-10 A refined logic of the cognitive map of the hypothesis 14. (E = a telecommunications company, BC(E) = the business consultancy unit of E, NI(E) = the network implementation unit of E, part-of(E)=BC(E), part-of(E)=NI(E))

6.3.6.2 Conceptual analysis

A conceptual analysis of the phrases and terms that appear in Figure 6-10 is as follows.

The set of the potential customers of BC(E) is a subset of the set of the potential customers of NI(E):

= potential-customer(BC(E))=x ⊃ potential-customer(NI(E))=x

Company C "Can be trusted"

= Customers can trust the company

= ∀ x ∈ customers(C): trusts(x, C)

A customer trusts company C

= (1) the customer believes that C can carry out its promises (= reliability), and

(2) the customer believes that the quality of the C's services is good

Reference

= Information about completed contract

D believes that C can carry out its promises (← C has good references)

The quality of the services of a consulting company C

= (1) C is impartial (integrity) and (←independence)

(2) C bases its advises on high class information and knowledge and

(3) C provides relevant information (← understands the business)

A consultancy company E is *impartial* in its advised solutions to a customer problem P,

= E evaluates all alternative solutions to a problem from the point of view of problem P alone (not from the point of view of P ∧ Q where Q = the hidden agenda of E)

Company E "Has something distinctive to offer"

= Company C can offer a service that contains something that (1) its competitors cannot offer and that (2) the customer D perceives as valuable

= ∃ s, (service(C)=s ∧ (∃ d: difference(s, competing-services(s))=d ∧ value(D)=d))

Independence

= Company is independent

= Company is not dependent on some other company

= ¬ ∃ x, company(x)=true ∧ ¬dependent(E, x)

Company E understands business B

= (1) E has knowledge about B and

(2) E has knowledge about what is relevant in B and

(3) E has knowledge about business processes in B and

(4) E has experience in executing processes in B and

(5) …

6.3.6.3 Example fragment of the cognitive map

The validity of hypothesis 14 is centred around the question whether a consultancy contract between E and a customer increases the probability of a system contract between E and the same customer (Figure 6-11 and Figure 6-12).

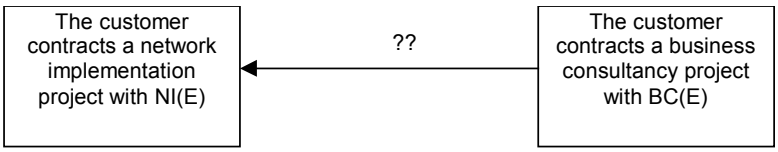


Figure 6-11 The example fragment of the cognitive map

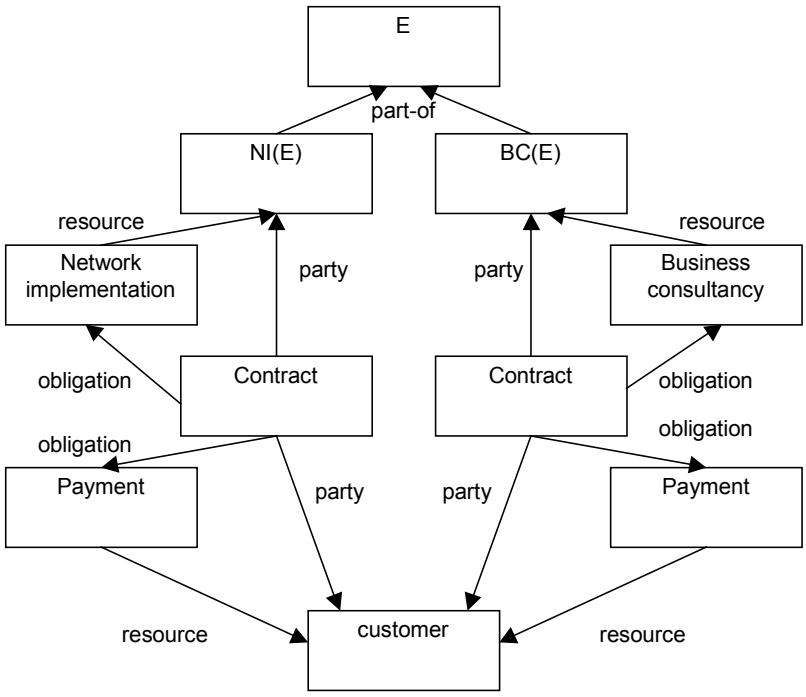


Figure 6-12 Objects in the example fragment

6.3.6.4 Observations

Observations concern occurrences of states of affair. Visually, the observations give information about various links between the objects (contracts, agents, activities).

Examples:

1. contract(?c)=true
2. customer(?c)=?x
3. supplier(?c)=BC(E)
4. signed(?c)=true

There may be a context for the observations that provides some of the information. The context is a set of axioms. For example, if the observations are made only about the signed contracts (that is, not about rumours of contracts), there would be the following axiom:

contract(?c)=true ⊃ signed(?c)=true

We can think of a context that is rich enough so that the observations are provided in the following form:

C(E, x): there is a concultancy contract between E and customer x

S(E, x): there is a system contract between E and customer x

6.3.6.5 Verification of the causal connection

The occurrences of specific states of affairs are regarded as instances of the classes (or patterns) of states of affairs. The causal connection between the states of affair is computed based on observations of the occurrences of both states of affair. Their probabilities are determined and the probability of the causal link is computed.

The causal link is

$C(E, x) \rightarrow S(E, x)$

The question is:

Is there evidence of the causal relationship?

Formalisation

We assume the sample space as the occurrences of all contracts.

$P_t(S\ (E, x))$ = probability that an occurrence of a state of affairs, that takes place before time t is a signed system contract where the supplier is E

$P_t(C(E, x))$ = probability that an occurrence of a state of affairs, that takes place before time t is a signed consultancy contract where the supplier is E

The hypothesis about a causal connection is the following:

$P_t(S(E, x) \mid C(E, x)) > P_t(S(E, x))$

6.3.6.6 A Study in Finding Information in the Internet to Test Business Hypotheses

We did an early study to explore how to find information from the Internet that would enable us to evaluate the truth of Hypothesis 14. The objective of the exercise was to determine if it is a good competitive move from the part of company E and whether we as company G should do something similar. This exercise was also reported in detail in Keijola (1999). We only summarise the results of the study here.

Our conclusions about finding information in the Internet where that useful agents for finding information already existed. However, there are issues that have to do with:

1. Directing the search: Which sites to chose, how deep to follow the links within a tree, extra tree, etc.
2. Managing volume and time: resources, including time, required and available.
3. How to manage information acquired: duplicity, timeliness, relevance, precision, reliability.

4. Further processing of information found: how to extract and interpret relevant information with precision, by whom or by what.

In addition we found that meaningful information about the kind of consultancy we were looking for was not much available. Indeed, one can imagine that it may be of such commercial nature that this is not a surprise.

6.3.7 Summary

In this section we have discussed the nature of business hypotheses and their role in a business plan. We have defined some categories of these hypotheses and shown examples of these. Finally, we have explored and shown how the hypotheses could be expressed and tested, initially with human experts, and eventually with computer assistance.

The idea of the hypotheses seems promising in that it may serve in simplifying models of business into partial models. However, as we have seen in the case of Hypothesis 14, even hypotheses that look simple to a human can become quite involved when they are broken down for presentation and analysis in a computer. This is not within the competence of a practising manager. Nor is it on his list of priorities.

In addition to creating a partial model there is the problem of feeding the model with data. This entails searching and making observations and creating capta, i.e. extracting relevant data from the observations and converting the data into a suitable computable format.

6.4 Conclusion

In this chapter we have considered some theoretical ideas and constructs that could be exploited in creating support systems for strategy work. We have described the ideas and considered the issues related to them. We started with lofty architectures for strategic support systems and ended with considering the details of testing a small logical element of a business plan, a business hypothesis.

We have recognised that the practical implementation of the ideas presented here is not a minor task, and not yet well understood. Constraints on our resources have lead

us to concentrate only on some aspects of the ideas. We now leave the theoretical considerations and turn to describe our construction, the BRIEFS System, which foremost deals with the problem of data.

7 The BRIEFS System

Support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.

1. What kind of computer based tools exist to support strategy work?
2. Are the tools used?
3. Is there a need for the tools?
4. What are the requirements for the tools?
5. **What could be the solutions for the tools?**
6. Could partial and useful solutions be built?
7. What does management think about the partial solutions built and why?

7.1 Introduction

We now outline the vehicle we developed to experiment with the idea of processing text and turning it into knowledge about business. At the time we started this research some partial systems existed but these were not available to us for several reasons, including financial, or they were considered not suitable. Also, no such comprehensive system we had envisaged was available.

The following sections give a general description of the Brief Driven Information Retrieval and Extraction for Strategy (BRIEFS) prototype system that has been developed in co-operation between the TAI Research Centre of the Helsinki University of Technology, the Department of General Linguistics in the University of Helsinki and the State Research Center (VTT). The system has been developed in three phases. The general results of Phase 1 are described in Keijola (2000a) and the results of Phase 2 in Keijola (2001). This description concentrates on, describes and reflects the state of the system as of February 2002, after conclusion of Phase 4 (there was no Phase 3). More detail can be found in Keijola (2002) and about the current state in www.briefscs.hut. fi.

As described in Section 6.1 our central tenet is that important and relevant information regarding our domain of interest - strategic business plans and events in the business environment - is available in textual format and can be processed by a computer. The aim of the BRIEFS System is to go beyond Information Retrieval which basically amounts to finding interesting documents for people to peruse. The

prime goal of the BRIEFS System is the extraction of specific interesting data from documents of text and making it computable for refinement on a computer for knowledge discovery and, eventually, hypotheses testing.

The BRIEFS System processes documents of text. Its intention is fourfold.
To support, based on a common base of linguistic and statistical analysis,

1. the conceptual modelling of a domain of knowledge,
2. the evaluation of the relevance of documents for a domain
3. the extraction of specific facts from the relevant documents.
4. turning the extracted information into knowledge about the domain.

We propose that these capabilities would help address our general issue which was the *support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.* We expect the capabilities to serve towards meeting the specific requirements we have identified:

1. Flexibility for accommodating changes in the environment and in the attention of business
2. Flexibility for changing strategic paradigms, to allow for deployment of new concepts in strategy
3. Flexibility in bringing a rich and open set of data into a decision making situation
4. Tolerate masses of irrelevant data and arrive at the best capta, set of relevant data
5. Tolerate incomplete and inaccurate data
6. Tolerate and be flexible about the uncertainty of future outcomes, allow for the possibility of dynamic multiple futures
7. Tolerate and be flexible about differences in inquiring organisations
8. Accumulate timely and comprehensive information and manage dynamic knowledge
9. Process and synthesise multiple views in an unbiased way.

We should aim to serve both the inductively working manager as well as the hypotheses testing manager, as was discussed in Section 4.7.

7.2 Central Ideas

There are four central ideas, in essence theories that the BRIEFS System is based on. The first, and perhaps the most ambitious, idea behind the BRIEFS scheme is that the process of business intelligence in a particular domain of interest can be driven by a document, to be called here the *Brief.* The Brief describes the context in and for which information is desired. Ideally, the Brief gives, like for any other task to be undertaken, the definition of the task and sufficient background information needed

for the successful execution of the task. E.g. if a technology domain is of interest the Brief could contain an expert state of the art description of the domain and its expected development and the current view about the significance (to the company) of the technology. If a business domain is of interest then the Brief should contain a description of the business and its future (the business plan!). The Brief thus is much more than a collection of simple key words or search phrases.

From the Brief it may be possible to infer what are the important concepts in the domain, what are their attributes and how closely the concepts may be related. (The choices made by the authors of the Brief also imply some tacit knowledge.) Based on the analysis a profile of the domain can then be built. The profile in turn serves as a reference base for evaluating the relevance of the acquired business intelligence to the particular domain.

The second central idea in the BRIEFS project is that associated with a domain of interest there can be some important hypotheses about the future, e.g. the commercialisation of some technology by some date or the expected rate of development of the price/performance aspect of a technology etc. These hypotheses could be organised for semi-automated follow-up with the BRIEFS project. This would entail extracting *domain knowledge* from the Brief in order to set up a (object based) knowledge model of the domain. The hypotheses in turn define a *template* to drive the extracting of relevant information. From the documents that have been deemed relevant by the information retrieval process specific information could then be extracted with the extraction algorithms. These algorithms would find and extract desired data from the documents and fill in the pre-defined templates with the desired data. The idea about hypotheses was treated in Section 6.3.

The third central idea in the BRIEFS concept is a consequence of the mechanisms described above. When individuals or organisations learn to understand a particular domain better they may want to redefine their domain of interest and indicate change in their needs for information. Most of the work that is then needed to affect this change is that a new or modified Brief be written or that new or modified hypotheses be developed. In this way the system will satisfy the requirement for dynamism and

adaptation which is crucial in today's business environment. Knowledge will accumulate in the form of tested hypotheses.

The fourth idea is that the accumulated information and its representation as formal knowledge may create new insights into the domain of interest. In other words data may form patterns, in essence models to enlighten the inductively working manager.

A schematic outline of the original BRIEFS System architecture is in Figure 7-1. In the following sections we describe in more detail the BRIEFS prototype system that has been developed.

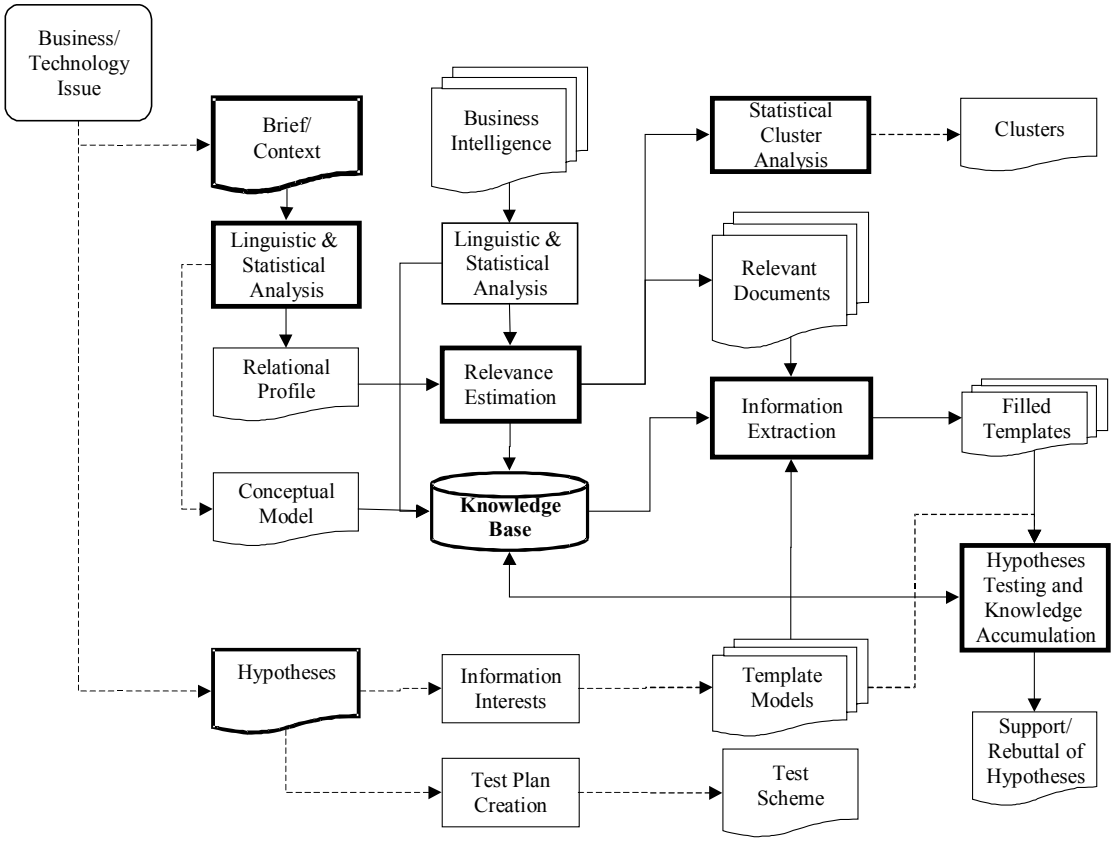


Figure 7-1. Outline of the original BRIEFS system architecture. Dotted lines indicate manual flow.

The system does not include search agents for acquiring documents. It assumes that sets of documents exist. This decision was made because a number of such adequate agents and information sources are already available.

7.3 The Gate Development System

We have adopted a system called Gate (General Architecture for Text Engineering) from the University of Sheffield as the development platform for our system (Cunningham (2000)). It has been in common use by language engineers (http://gate.ac.uk). Gate can be considered as the "Windows" for language processing systems. Users of Gate build their own applications using the basic services provided by Gate. Gate administers collections of texts together with their associated annotations. The annotations are generated and associated with the original text in the course of processing of the text by the BRIEFS programs. Gate offers a variety of viewers into the original text and its annotations. It allows for creation of alternative processing pipelines so it is easy to develop and test alternative algorithms. Gate follows the TIPSTER architecture as defined by DARPA (http://www.itl.nist.gov/iaui/894.02/related_projects/tipster/). We have used Gate Version 1.

Our system runs currently on Red Hat Linux 7. As the main programming languages we have used Perl and Java.

7.4 General Structure of the System

Figure 7-2 shows the main menu of Gate and the entrance to the main parts of the BRIEFS System. The basic BRIEFS System consists of the Modelling part, the Relevance Evaluation part and the Information Extraction (IE) part. All three parts have a common linguistic processing sub-scheme.

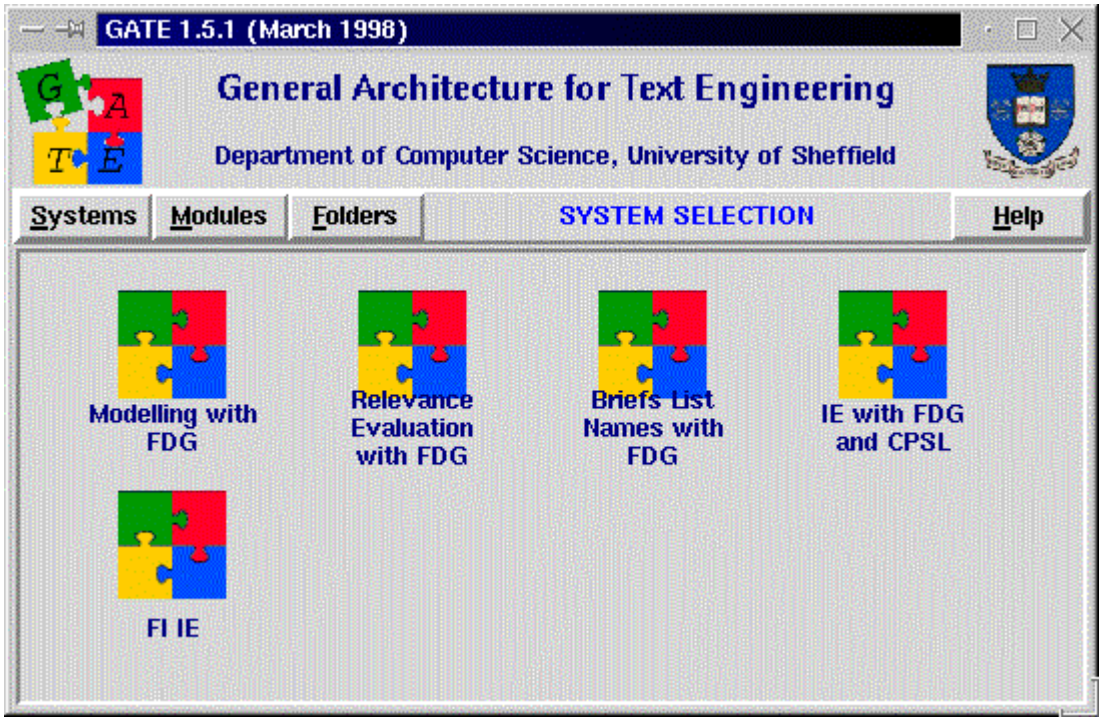


Figure 7-2 The Gate Main Menu - Entrance to BRIEFS Functions

7.5 Basic Linguistic Processing

The linguistic processing serves two purposes. The first is that before we get to the following processing phases we have identified and reduced the text to a sound set of terms and their roles. E.g. selected multi-word terms can be combined to form one term. The second purpose is to support conceptual modelling and semantical processing of the domain.

We have used two commercially available tools for basic linguistic processing. In Phase 1 we used the engcg (English Constraint Grammar) parser from Lingsoft Oy in Finland. Since phase 2 we introduced the fdg (functional dependency grammar) parser from Connexor Oy. Fdg can be considered a superset of engcg and provides additonally information about the linguistic dependencies of tokens in a sentence. Both products have their origins in the Department of General Linguistics in the University of Helsinki. The products take care of basic linguistic processing from tokenisation to morphological analysis to assigning the part of speech and syntactic

role to the tokens[15]. We have used fdg parsers for the English and the Finnish languages.

7.6 Additional Linguistic Processing

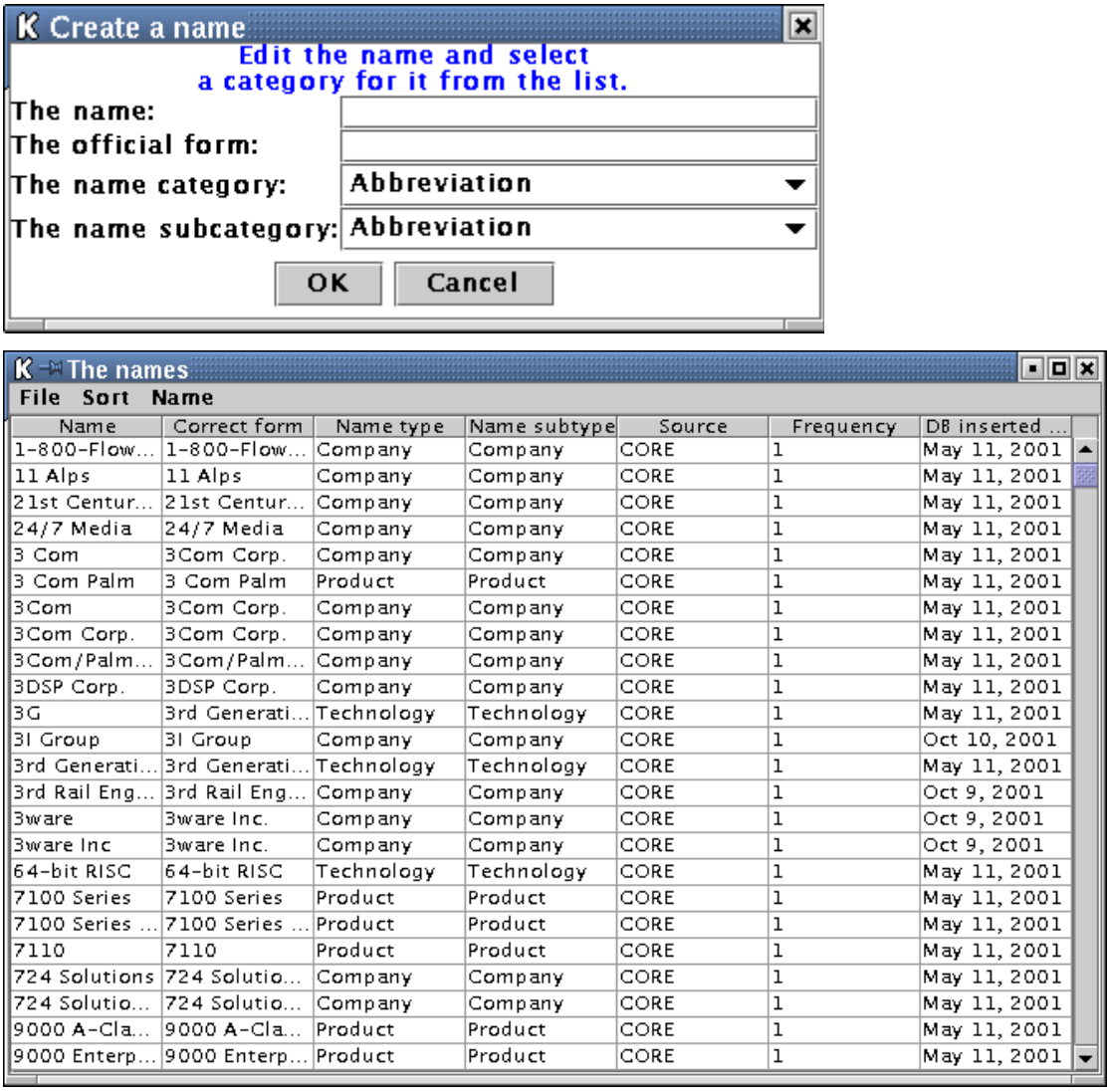
Some additional linguistic processing follows basic processing. (Please, see Figure 7-4 in the following discussion). First, numerical expressions are identified. Second, there is the recognition and classification of proper names (e.g. companies, persons, products,…). Third, noun phrases in the domain are identified.

Numerical expressions are identified (dates, currencies and physical measures) by Briefs Numex. The expressions are converted to standard formats with "value" and "unit of measure". This makes the expressions computable, a prime goal of the BRIEFS project.

The general processing of names in Briefs Name relies on pre-processing by fdg which identifies proper names in text. However, more granularity in the classification of names than provided by fdg might be required. This is the main function of the Briefs Name and Briefs Guess functions. The function of the co-reference processing in Briefs Coref is to address different ways to write for example the name of a company as well as to resolve simple references to a name by pronouns or expressions such as "they" or "the company". A more detailed description of name processing can be found in Viitanen and Keijola (2002).

To assist in the identification, classification and accumulation of names and special terms a Names Editor has been built. The Editor supports the verification and editing of the results of Briefs Name. A snapshot of the Editor is shown is Figure 7-3.

[15] For more detailed description see www.lingsoft.fi and www.connexor.com



Name	Correct form	Name type	Name subtype	Source	Frequency	DB inserted ...
1-800-Flow...	1-800-Flow...	Company	Company	CORE	1	May 11, 2001
11 Alps	11 Alps	Company	Company	CORE	1	May 11, 2001
21st Centur...	21st Centur...	Company	Company	CORE	1	May 11, 2001
24/7 Media	24/7 Media	Company	Company	CORE	1	May 11, 2001
3 Com	3Com Corp.	Company	Company	CORE	1	May 11, 2001
3 Com Palm	3 Com Palm	Product	Product	CORE	1	May 11, 2001
3Com	3Com Corp.	Company	Company	CORE	1	May 11, 2001
3Com Corp.	3Com Corp.	Company	Company	CORE	1	May 11, 2001
3Com/Palm...	3Com/Palm...	Company	Company	CORE	1	May 11, 2001
3DSP Corp.	3DSP Corp.	Company	Company	CORE	1	May 11, 2001
3G	3rd Generati...	Technology	Technology	CORE	1	May 11, 2001
3I Group	3I Group	Company	Company	CORE	1	Oct 10, 2001
3rd Generati...	3rd Generati...	Technology	Technology	CORE	1	May 11, 2001
3rd Rail Eng...	3rd Rail Eng...	Company	Company	CORE	1	Oct 9, 2001
3ware	3ware Inc.	Company	Company	CORE	1	Oct 9, 2001
3ware Inc	3ware Inc.	Company	Company	CORE	1	Oct 9, 2001
64-bit RISC	64-bit RISC	Technology	Technology	CORE	1	May 11, 2001
7100 Series	7100 Series	Product	Product	CORE	1	May 11, 2001
7100 Series ...	7100 Series ...	Product	Product	CORE	1	May 11, 2001
7110	7110	Product	Product	CORE	1	May 11, 2001
724 Solutions	724 Solutio...	Company	Company	CORE	1	May 11, 2001
724 Solutio...	724 Solutio...	Company	Company	CORE	1	May 11, 2001
9000 A-Cla...	9000 A-Cla...	Product	Product	CORE	1	May 11, 2001
9000 Enterp...	9000 Enterp...	Product	Product	CORE	1	May 11, 2001

Figure 7-3 BRIEFS fdg Names Editor

The output of the fdg parser is exploited to form noun and verb phrases in Briefs Xp. Noun phrases may indicate multi-word terms or what kinds of attributes are used to qualify the concepts in a domain. The selection of phrases to be used as compound terms can be made automatic or it can be fully user controlled.

7.7 Modelling and Basic Statistical Processing

Figure 7-4 shows the BRIEFS processing pipeline implemented in Gate for the Modelling part. It consists of the basic and extended linguistic processing phases as well as the statistical processing phase.

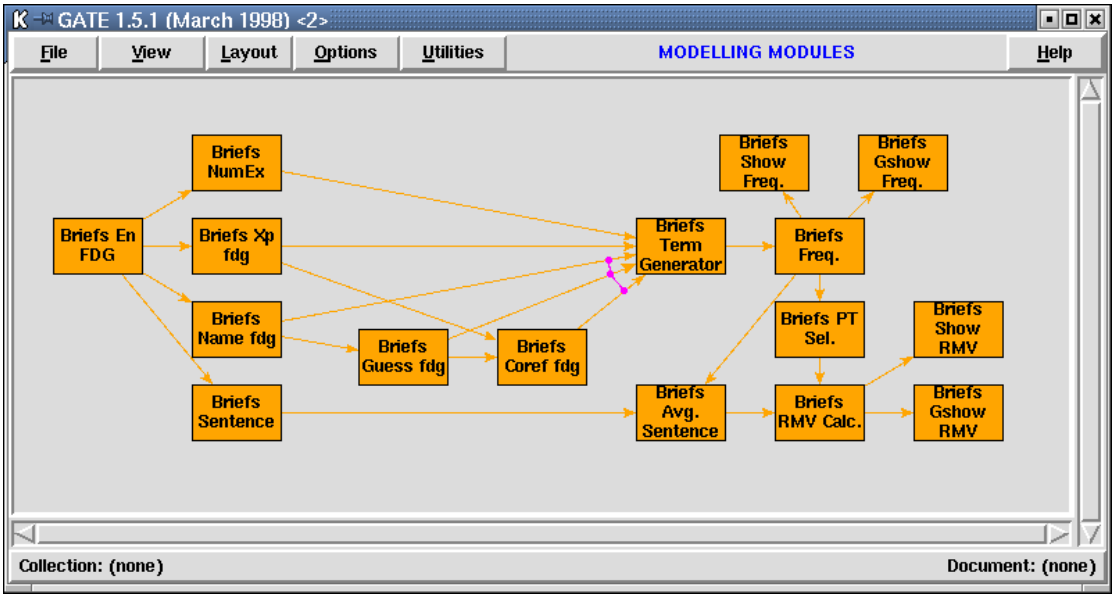


Figure 7-4 BRIEFS Modelling with fdg parser

Briefs Term Generator creates the terms which form the units of calculation in subsequent statistical processing. Results of Numex are currently prioritised highest, then the results of Name, then the results of Xp processing and lastly the remaining tokens.

For the statistical processing of text we have implemented a method developed at NASA. It is called Quorum and it is described in Seitsonen (2001) and in more detail in McGreevy (1995,1996, and 1997). We chose Quorum because it is possible to understand and manage it well. Its results are, unlike some other statistical or neural network scheme, simply traceable. In addition, it is relatively simple to implement. In the Quorum scheme a limited number of key terms, often the most frequent terms, are selected from the document to be processed. These terms will be called Probe Terms. In the subsequent processing a window of certain length is moved over the document and the presence of the Probe Terms and their proximity to all terms within the window is noted. The closer and the more often a pair of terms occurs within the document the stronger the relation is valued. The measure used is called Proximity Weighted Relational Metric Value (RMV). The collection of these relations forms the statistical profile for the document.

We have implemented the Quorum calculations as suggested by McGreevy with the flavour that we can choose whether we use the token form of a term or its root form or

its root form appended with part-of-speech (POS) or its root form appended with POS and syntactic role.

Figure 7-4 also shows the Gate processing scheme for RMV calculations. Briefs Freq. calculates the frequencies of the terms. These can be examined in tabular form by invoking Briefs Show Freq or in graphical form by invoking Briefs Gshow Freq.

The next phase is to select the Probe Terms (Briefs PT Sel). This selection can be made automatic or it can be fully controlled by the user. The user can also indicate which form of the terms is to be used in the statistical calculations (surface form, root, POS, syntactic role or a combination of these).

Briefs Avg Sentence calculates the average sentence length of the document. This can be used to determine the size of the window to be used in the following RMV calculation.

Briefs RMV Calc performs the RMV calculations. The results can be viewed in tabular form by invoking Briefs Show RMV or in graphical form by invoking Briefs Gshow RMV. Embedded in RMV Calc are functions which calculate the standard deviation of the RMV of a particular relation as well as create information about the total significance of a Probe Term in the document (Seitsonen (2001)). Brief Self Relevance which is also embedded in RMV Calc calculates the relevance of the document for itself (see discussion in Section 7.8).

7.8 Relevance Evaluation

The objective of relevance evaluation is to find related texts, for example to identify documents that are interesting for a particular domain.

In the BRIEFS relevance evaluation one document is taken as a reference document and the relevance of other documents to the reference document are estimated. Figure 7-5 depicts the BRIEFS relevance evaluation scheme.

The documents to be evaluated are examined and scored based on the proximity weighted relational profile of the Brief.

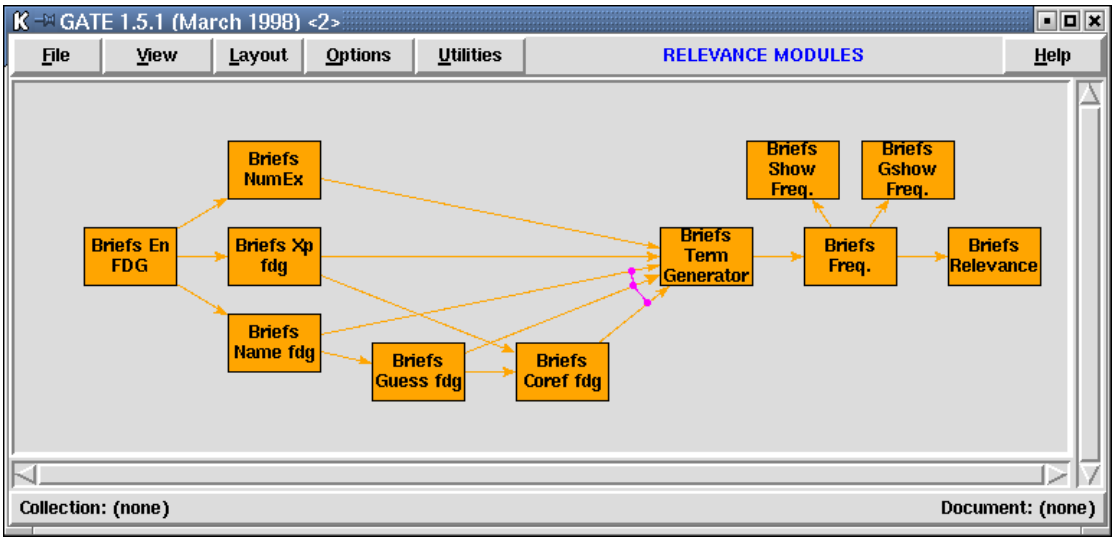


Figure 7-5 BRIEFS Relevance Evaluation with fdg parser

Before the actual relevance evaluation the documents to be evaluated for relevance undergo basically the same linguistic processing as described in Sections 7.5 and 7.6. Term frequencies are also calculated in the same way as described in Section 7.7.

The relevance evaluation scheme implemented in Briefs Relevance is based on a scheme suggested by McGreevy et al (1997). It utilises the Relational Metric Value as discussed in Section 7.7 The more a document to be evaluated contains the same important relations as the reference document the more relevant the document is in the context of the reference document. The resulting score is called Relevance Ranking Value (RRV). The scheme is discussed in more detail in Seitsonen (1998).

7.9 Information Extraction

The objective of information extraction is to extract from the relevant documents specific information that may be interesting for a particular domain. One can envisage a refinement process which starts with text and results in knowledge as shown in Figure 7-6

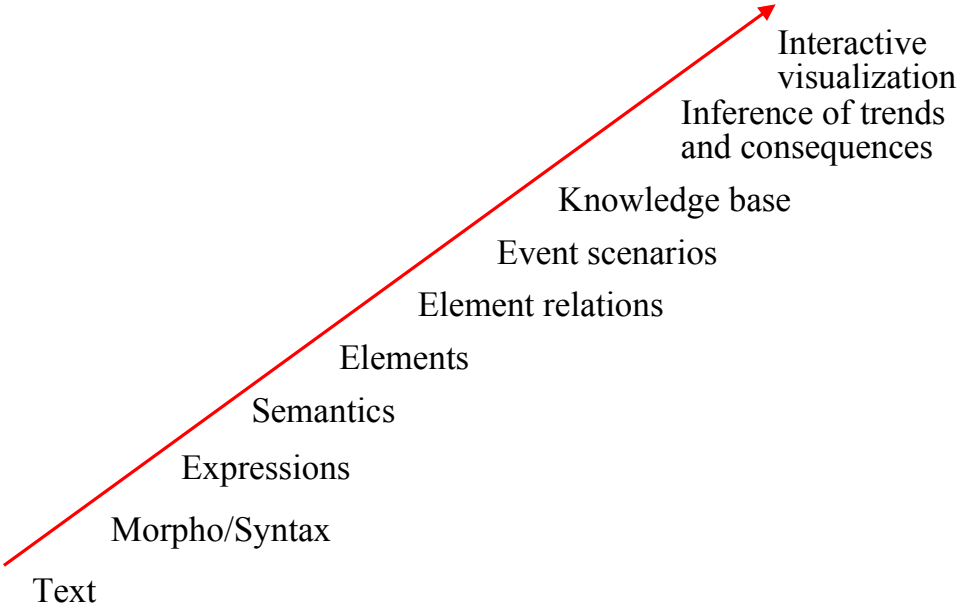


Figure 7-6 BRIEFS Refinement Process

Information extraction is driven by a set of templates, or skeleton tables which define the information to be extracted. Templates, also called scenario templates, are envisioned to represent summaries of event scenarios. They consist of a set of template elements and template element relations which constitute the detailed data. An example could be a Business Deal template which consists of template elements which specify the date of the deal, the type of the deal, the companies participating in the deal, the value of the deal and the purpose or the objective of the deal.

The extraction process is multiphase and rule based. We chose a rule based extraction scheme rather than a statistically based scheme because it gives us full and simple control. The results of extraction are always traceable to the set of rules that fired the extraction.

A rule description language called Common Pattern Specification Language (CPSL) has been implemented (Cowie and Appelt (1998)). The rules specify how the information required by the template elements is to be extracted from text and how the template elements are to be combined to form templates. The rules can exploit results of all linguistic analysis and extracted data from previous phases. We have developed a Rule Editing Tool to ease the process of creating the rules. A sample snapshot of the Tool is shown in Figure 7-7.

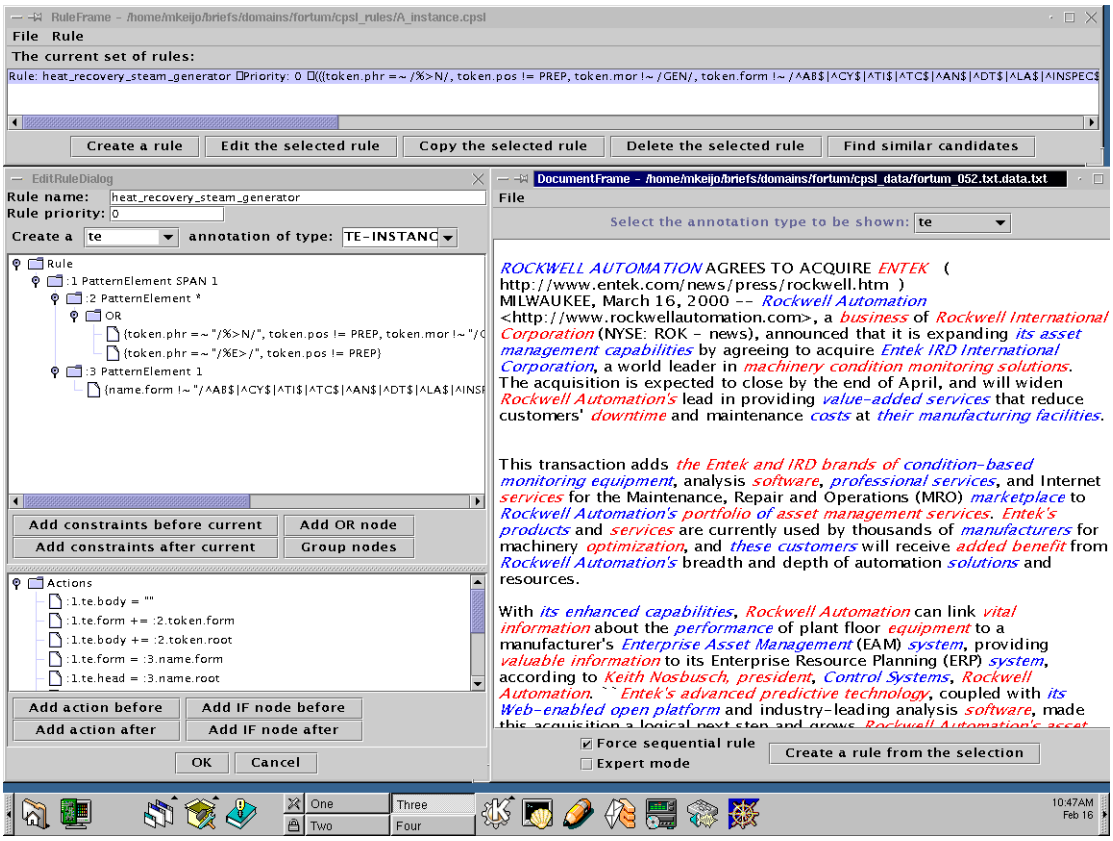


Figure 7-7 BRIEFS fdg Rule Tool

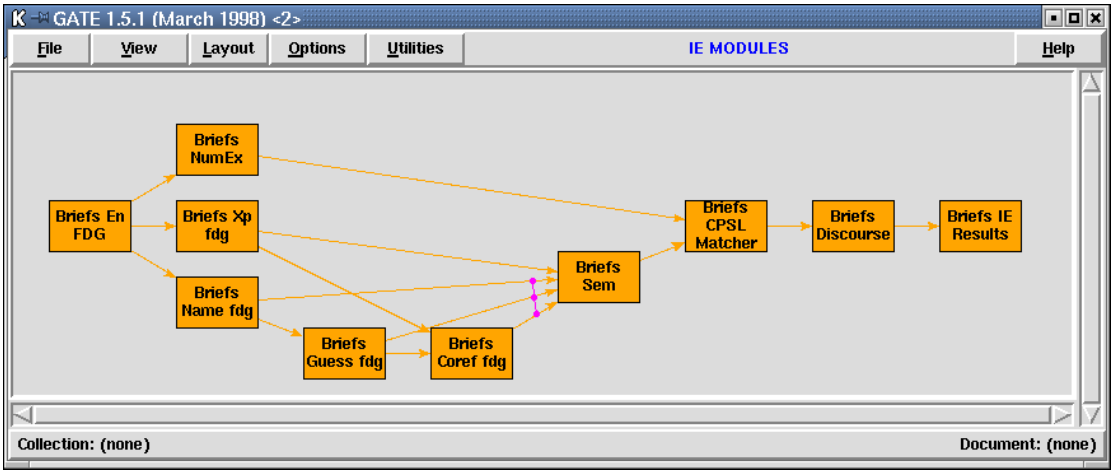


Figure 7-8 BRIEFS Information Extraction with fdg and CPSL

The BRIEFS information extraction scheme is depicted in Figure 7-8. The processing starts again with the same basic linguistic processing as in modelling and in relevance evaluation. Statistical information is currently not used, however.

The task of Briefs Sem is to identify the semantic categories of certain terms. Semantic categories combine a set of terms indicating (for the purposes of the extraction) essentially the same thing. For example the semantic category “sem-order” could include members such as “order”, “sale”, “contract” etc. Semantic categories are used to minimise the number of rules. The rules can be written once for a category rather for every instance of that category.

Briefs CPSL Matcher executes the extraction rules and fills in template elements from the text. Template elements typically represent an entity such as a person, a company, a product etc. Information inherently belonging to the entity can be collected to a template element.

Rule matching is an iterative process: results of the previous rounds of matching can be utilised in subsequent rounds. In this way rules to establish relations between template elements created in previous rounds can be designed. The relation rules collect facts that depend on the relation between entities rather than on the entities themselves. Examples are ""product" marketed-by "company" at "price"", ""product" manufactured-by "company"", ""person" employed-by "company" as "title", "function"".

Even higher level constructs can be created by combining template elements into complete scenario templates. The scenario templates represent events such as business deal-made or product-announced.

Briefs IE Results collects all the results of the matching process and stores them in a file. These results are subsequently stored in an MySQL Evidence Database which is structured as depicted in Figure 7-9.

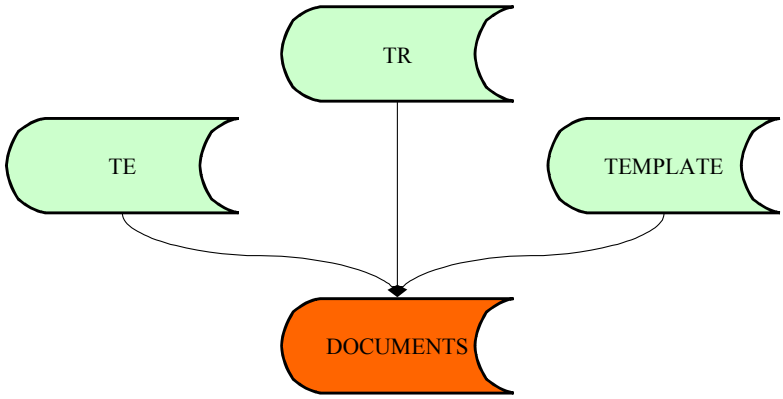


Figure 7-9 The Evidence Database. TE holds Template Elements, TR holds Template Element Relations, TEMPLATE holds Templates and DOCUMENTS holds the original documents.

7.10 Query and Visualisation of the Evidence Database

The information in the Evidence Database can be queried using SQL queries and the results of these queries can be visualised. Some sample queries have been implemented. These will be described in Chapter 8.

7.11 Knowledge Processing

7.11.1 Knowledge Base

At the heart of the BRIEFS System is the Briefs Knowledge Base (BKB). It constitutes all knowledge accumulated in and for the information refinement processes. It consists of a Core Base and one or more Domain Bases, one for each Domain. The structure of the Bases and the domains is basically the same. The general conceptual scheme of the Knowledge Base is depicted in Figure 7-10.

Typical knowledge in the BKB comprises known names of objects and their characteristics (such as persons, companies, titles, cities, countries, products, …) and standard expressions and phrases. At the moment we already have thousands of names. The BKB also comprises all the rules needed for information extraction. Finally, it comprises all the information (evidence) gathered in the information extraction processes (such as template elements, template element relations and scenario templates) and the facts of knowledge created based on this evidence.

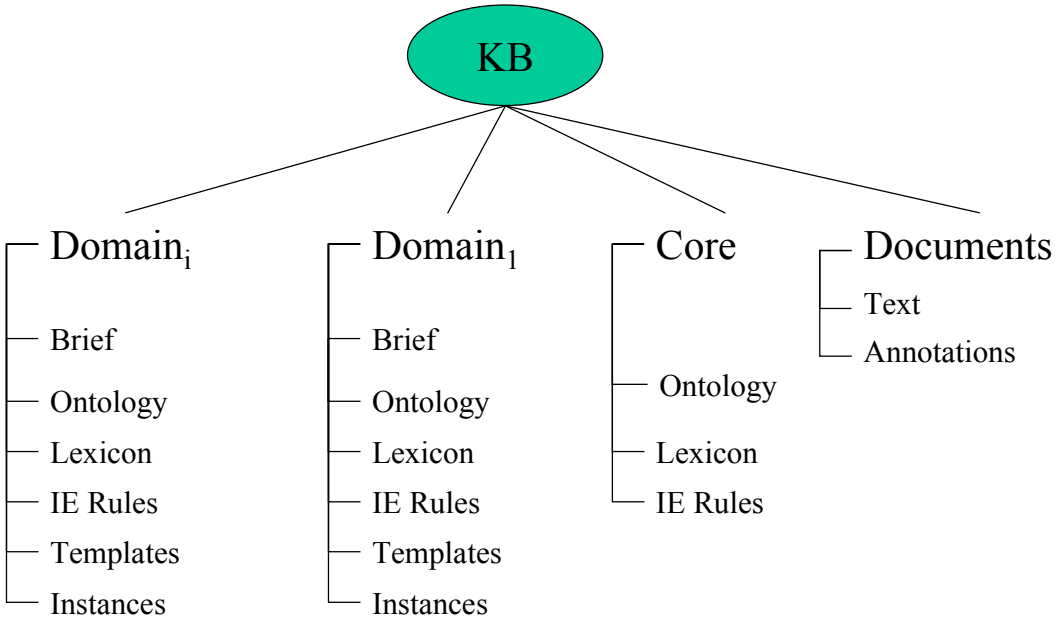


Figure 7-10 The BRIEFS Knowledge Base

7.11.2 Ontology

The ontological tool used in the project is the Conceptual Network (CONE) software developed by VTT Information Technology. In particular, for describing knowledge of different problem domains in the form of ontologies the CONE Editor is made use of. The ontologies represented in the BKB are the Core Ontology, describing concepts and relations that are common to different problem domains, such as entities related to time and space, and domain ontologies, describing concepts and relations that are specific to given problem domains. A domain ontology provides a conceptual structure of the problem domain that information is collected and queried about. Each concept of an ontology is of some concept type. Additionally, a concept has a number of atomic properties (attributes) and one or more outgoing and/or ingoing typed links (relations). A sample snapshot of the definitions in a domain ontology is depicted in Figure 7-11. The evidence information in the BKB is mapped against ontologies and structured accordingly. This enables to submit complex queries, requiring inference based on the instances of the problem domain. For example, a complex query may be about a change in the deal structure (strategic direction) of a company over time.

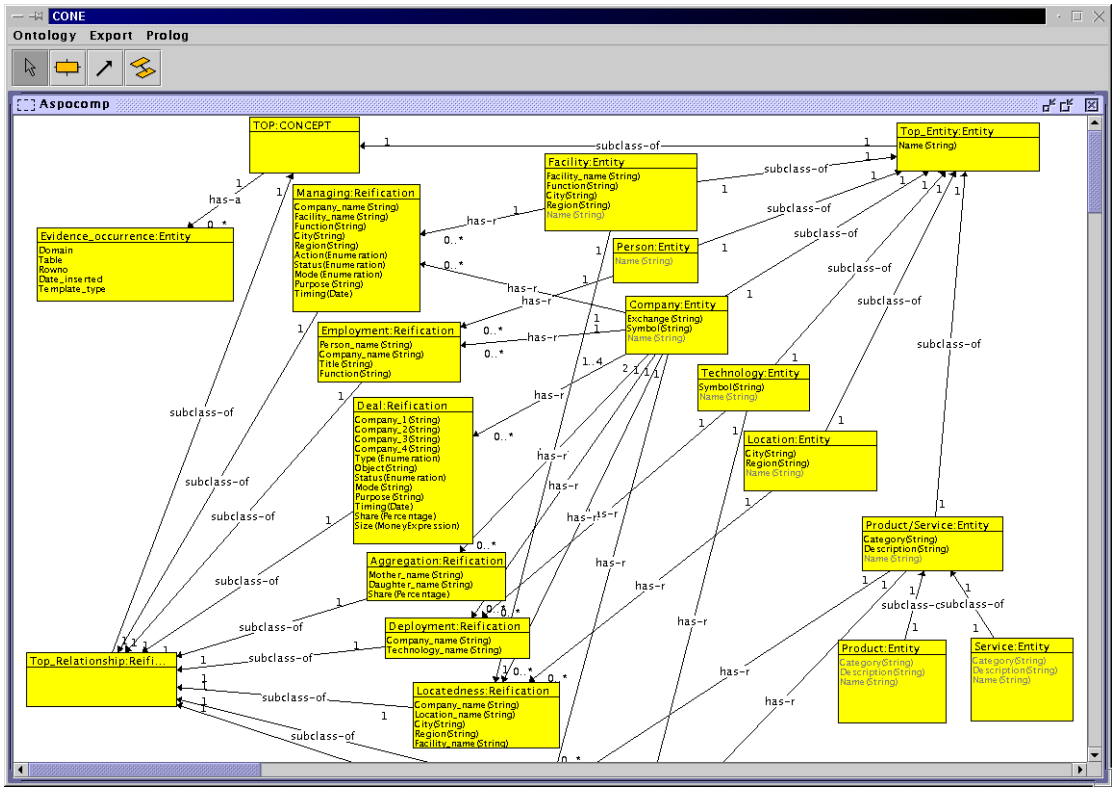


Figure 7-11 A sample ontology in Cone

7.11.3 Instances Base

The domain evidence collected in the Information Extraction phase is used to create instances in the Instances Base. The Instances Base observes the structure and the internal logic as described by the corresponding domain ontology. This means that each concept instance has properties and outgoing links, defined in the corresponding concept of the ontology. Properties possess values that are assigned to them based on the domain evidence collected in the Information Extraction phase. In the same manner, links between different instances are defined according to the evidence information received during the Information Extraction phase. The Instances Base can be visualised and graphically accessed using the CONE software much in the same way as the ontologies.

7.11.4 Querying the Instances Base

The Instances Base can be queried using the CONE software. Simple queries can ask for the employment history of a person or for persons whose job title has changed. More complex queries can be aimed at e.g. finding a new (to BKB) company as a participant of a (particular type of) deal or business events of certain types (e.g. deals)

taking place in a certain geographical region during a certain period of time. Some sample queries have been implemented, as we will show in Chapter 8.

7.12 Summary

In answering the research questions "what could be the solutions for the tools?" and "could partial and useful solutions be built?" we have described a partial solution, the BRIEFS System which we actually built. Undoubtedly there could be other solutions but we claim the ones presented here could help address especially the flexibility-related and tolerance-related requirements identified earlier. Table 7-1 outlines how the BRIEFS System is intended to address the requirements we have identified.

Table 7-1 How the requirements identified could potentially be addressed in BRIEFS

Requirement	Response in BRIEFS
1. Flexibility for accommodating changes in the environment and in the attention of business	Creation of a new Brief Creation of new templates
2. Flexibility for changing strategic paradigms, to allow for deployment of new concepts in strategy	New Brief
3. Flexibility in bringing a rich and open set of data into a decision making situation	Selection of sources of data
4. Tolerate masses of irrelevant data and arrive at the best capta, set of relevant data	Accurate rule system Ontological Knowledge Base
5. Tolerate incomplete and inaccurate data	Ontological Knowledge Base Masses of processed data is tolerant to errors
6. Tolerate and be flexible about the uncertainty of future outcomes, allow for the possibility of dynamic multiple futures	Knowledge Base allows for alternative interpretations
7. Tolerate and be flexible about differences in inquiring organisations	Freedom to create Briefs and templates
8. Accumulate timely and comprehensive information and manage dynamic knowledge	Exploitation of Knowledge Base
9. Process and synthesise multiple views in an unbiased way.	Rule system is consistent night and day. Views can be altered by varying sources of data

In the terms of O'Leary (1998) of "knowledge connecting" and "knowledge converting", discussed in Section 4.5.3, our system fundamentally is intended to connect knowledge to knowledge by the activity of knowledge discovery from textual documents.

Was the BRIEFS System the best possible choice? What actually can be done with it? What may be its benefits and drawbacks? What problems may be solved with it? We will come back to these questions after we first describe, in the next chapter, some experiments which we have conducted with the system.

8 The Experiments

Support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.

1. What kind of computer based tools exist to support strategy work?
2. Are the tools used?
3. Is there a need for the tools?
4. What are the requirements for the tools?
5. What could be the solutions for the tools?
6. **Could partial and useful solutions be built?**
7. What does management think about the partial solutions built and why?

8.1 Introduction

In the previous chapter we described our construction, the BRIEFS System. In this chapter we readdress the "could useful partial solutions be built?" question. The emphasis now is on "useful". We describe and analyse the results of some demonstrative experiments we have conducted.

We first address some methodological issues in Section 8.2. Sections from 8.3 to 8.5 describe the experiments we have conducted with the language-based capabilities of BRIEFS. These experiments include identifying concepts and relations in a domain and studies of industries and companies. In terms of the capabilities of the BRIEFS System this means experimentation with its modelling, relevance evaluation and information extraction functionality. An extensive case to show how a Brief could tie up the whole process from modelling to information extraction remains a future project. Section 8.6 shows what additional possibilities knowledge-based processing could bring.

8.2 Methodology and the Cases

The BRIEFS System builds on a number of key technologies: basic natural language processing, information extraction and knowledge engineering. Each of these technologies has schemes of their own for designing experiments, measuring results and evaluating them. In our case we are primarily interested in showing managers what could be achieved with the emerging technologies and then finding out what their response is. Therefore the experiments to be described in the following have not been conducted following in all respects the rigorous procedures common in the key

technologies. There is also a second reason for this. There is a lack of common, publicly available test material that could have been used in our experiments. To catch managers' interest up-to-date cases that are close to their businesses are needed and currently there does not seem to be such material available. Satisfactory creation of such material was beyond the resources of this research. A third problem relates to test material, too. It is the confidentiality aspect of the strategy domain. Companies are not willing to disclose their true strategic thinking and plans. For this reason some of the cases in the following are not necessarily truly strategic. However, it is claimed that they serve to illustrate potential uses in the field of strategy.

The cases to be discussed in the following have thus been selected such that they demonstrate some capability of BRIEFS, process data that is of interest to the participating companies and produce output that can be evaluated for plausibility by the companies. The input data has been obtained either from one of the companies or from some other source deemed reliable and consistent.

In the interpretation of the results we do take a positivist inductive-deductive approach.

It should be noted that BRIEFS has been developed over several years and not all experiments have been based on the latest version. With regard to the results presented here we do not consider this being of great significance.

8.3 Identifying the Concepts and Relations in a Domain

8.3.1 Description

Any modelling exercise must start by building a basic understanding of the domain as was shown for example by the study described in Section 5.6.3.1, "A Study in Finding and Understanding Information in the Internet". It is first necessary to identify the key concepts of the domain and the relations thereof. Ideally we should build an ontology of the domain. The modelling capability of the BRIEFS System was conceived of to assist in this. The following exercise is a summary description of such an effort. The exercise is reported in more detail in "Analysing Text for Domain Modelling and Relevance Ranking" in Keijola (1999).

One of the four information cases discussed in Section 5.6.3.1 was related to the fuel cell energy technology. We had been interested in the status of the technology and its commercialisation. We decided to take the report of this case study and apply an early version of BRIEFS to it. Our objective was to study how the QUORUM method (McGreevy 1995, 1997,1998) could help in modelling the knowledge domain of the fuel cell.

After basic linguistic processing we first analysed the frequencies of the words in the document and then, after selecting the probe terms, followed by an analysis of its relations. The frequencies of words or terms in a document do not conform to normal distribution. They tend to approximately follow the so-called Zipf's law which states that the product of the frequency rank and the frequency of a term is approximately constant (Lebart et al. (1998)). In the fuel cell document the power-like frequency distribution ($y = ax^b$) is as is shown in Figure 8-1 and cumulatively in Figure 8-2. About 180 most common distinct words (11%) represent half of the total word count of the document (i.e. about 2600 of 5206 words in total) and the 50 most common distinct words represent 29% of the total word count.

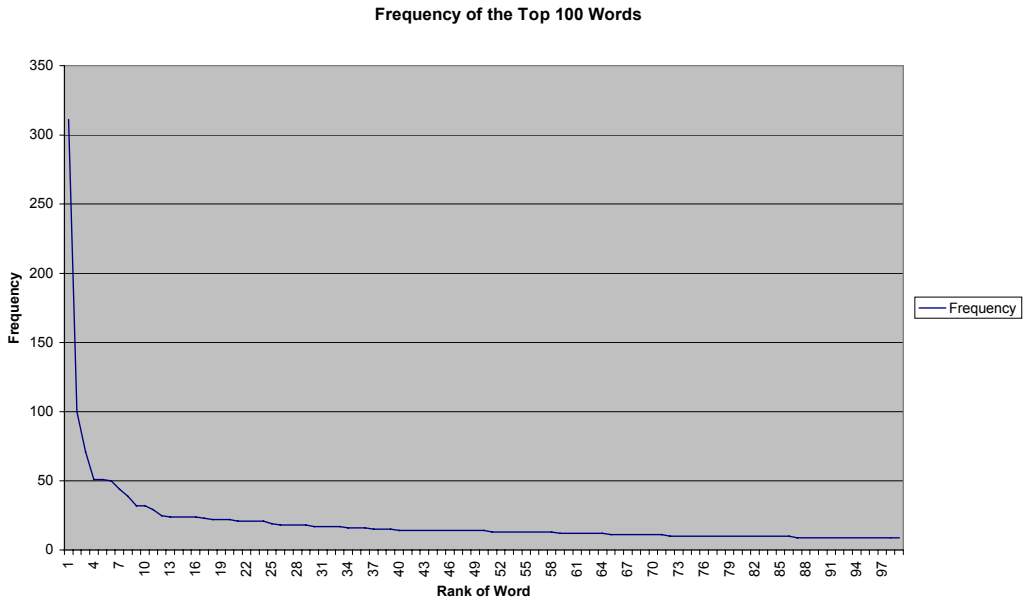


Figure 8-1 Frequency distribution of the top 100 words by rank in the Fuel Cell document

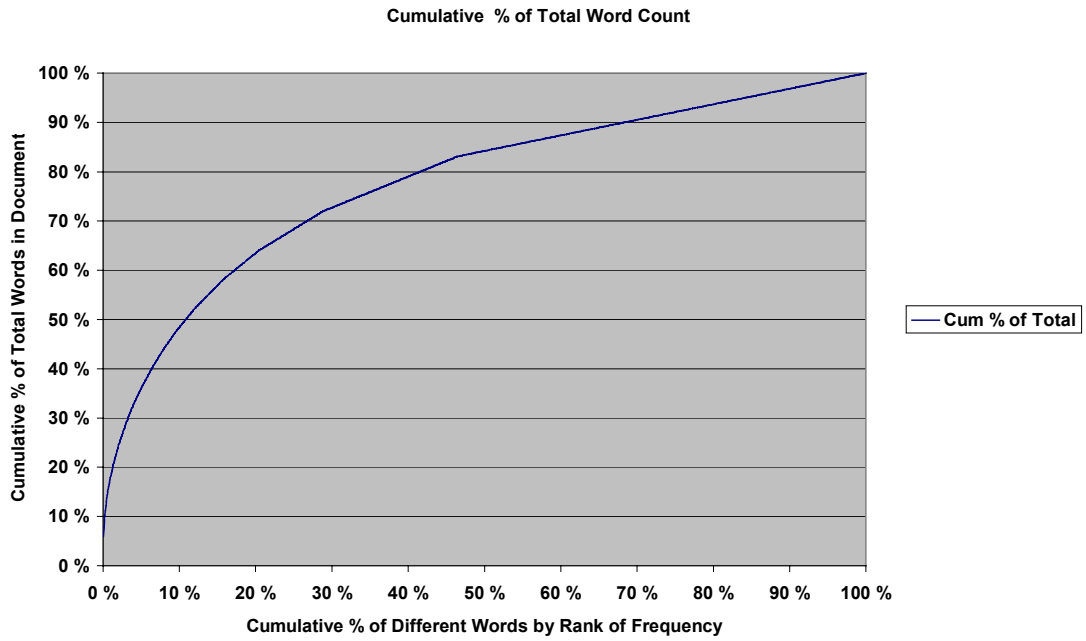


Figure 8-2 Normalised cumulative frequency distribution of total count of words in the Fuel Cell document

A power-type distribution is also characteristic of the pairwise relations of the terms as measured by the Relational Metric Value (RMV) defined in QUORUM (McGreevy (1995)). The distribution of RMV of the most important (in terms of the RMV) relations in the fuel cell document are shown in Figure 8-3.

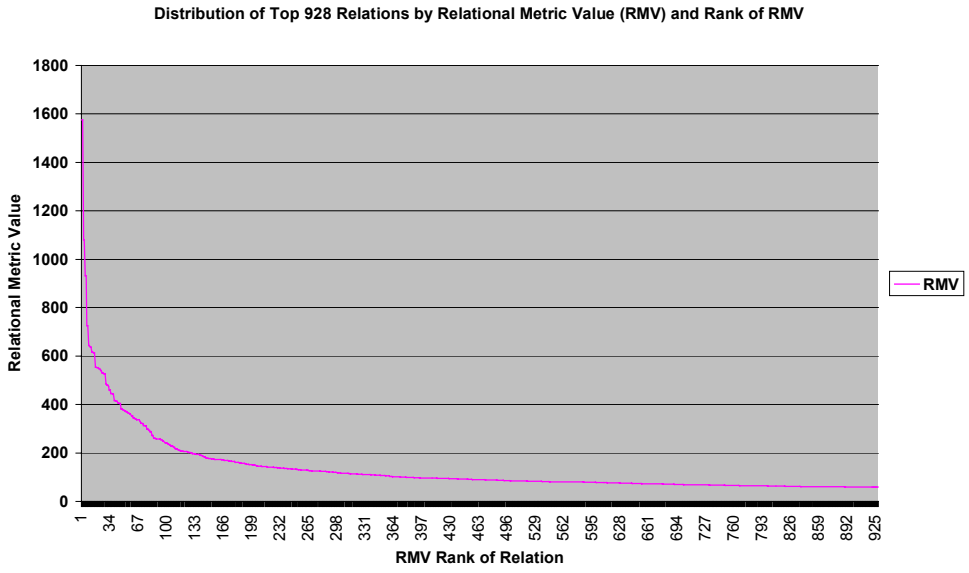


Figure 8-3 Distribution of top 928 Relations in the Fuel Cell document by Relational Metric Value (RMV) and rank of relation

Relatively few terms and relations thus tend to dominate in a document.

The relations form networks of terms. These can be visualised e.g. like Figure 8-4 shows for the 100 most important relations.

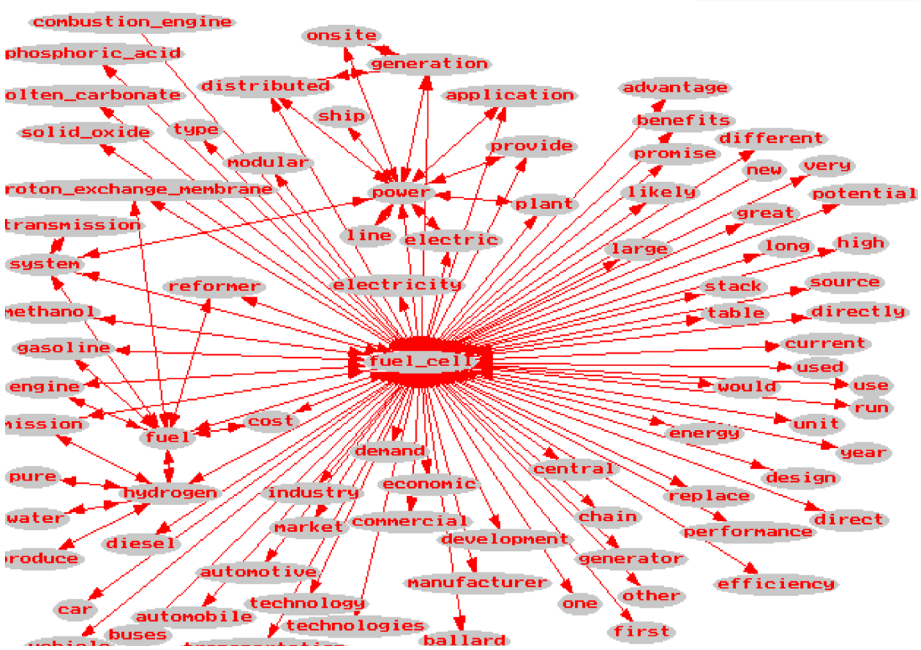


Figure 8-4 The 100 most important relations, by RMV, in the Fuel Cell document. Arrows connect related terms. Strength of relation is not shown.

The results of the calculations can be combined to show the strength of the individual relations and the centrality of the terms. The strength of a relation is measured as the normalised[16] RMV (NRMV) of a relation. The centrality of a term is measured as the normalised sum of the normalised RMV (NTNRMV) of all of its relations. An object-oriented model can now be developed and the measures can give guidance in the process. One would start with the most central term and then proceed with its most important relations. An example for the most significant terms in the document, "fuel_cell" and "power" and their relations, is shown in Figure 8-5.

[16] Normalisation is performed by taking the highest value in the document, giving it the value 1, or 100%, and calculating all other values in proportion to the highest value.

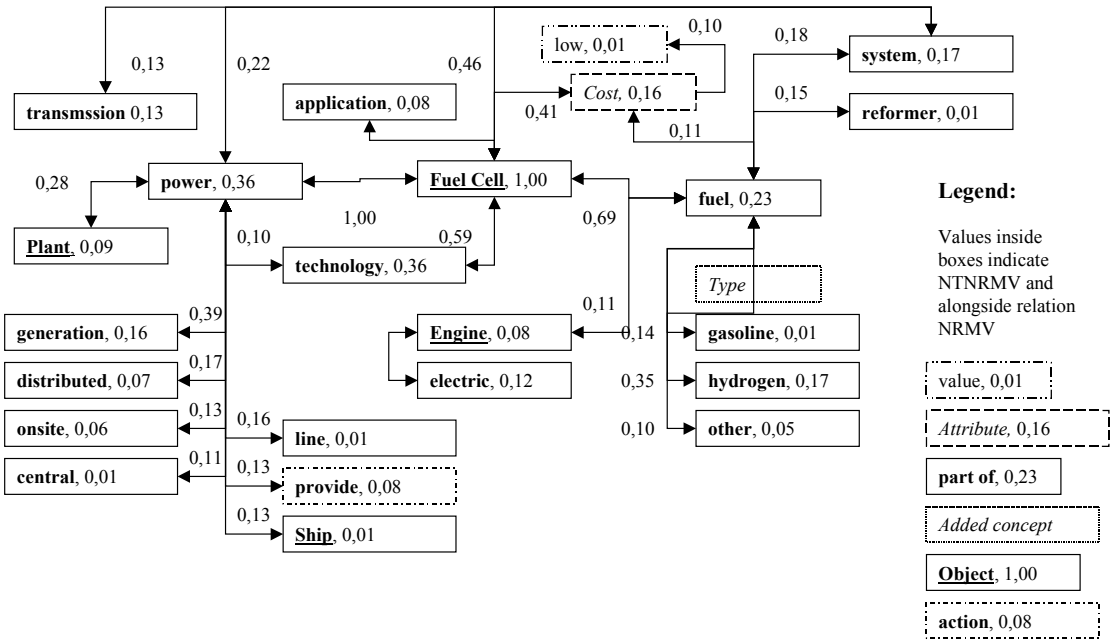


Figure 8-5 A partial model of the Fuel Cell domain developed for the terms "fuel_cell" and "power". NTNRMV (Normalised Total Normalised Relational Metric Value) and NRMV (Normalised Relational Metric Value) indicate the centrality of a term and the strength of a relation, respectively.

8.3.2 Discussion

The partial model which is shown in Figure 8-5, reflects the language and the terms used in the fuel cell document. The conceptual development procedure suggested above in essence leads to consistently adopting what Uschold et al. (1996) describe as the "middle out" approach in developing an ontology. In this approach one starts with the most common concepts and then proceeds to less common concepts up and down in the hierarchies of concepts.

Other models could have resulted starting from some other document about fuel cells or from the intuition of human beings. For example, contrast the model above with a taxonomic model which was independently and manually created, by the author of the fuel cell document together with the author of this thesis, to structure the field. This model is shown in Figure 8-6

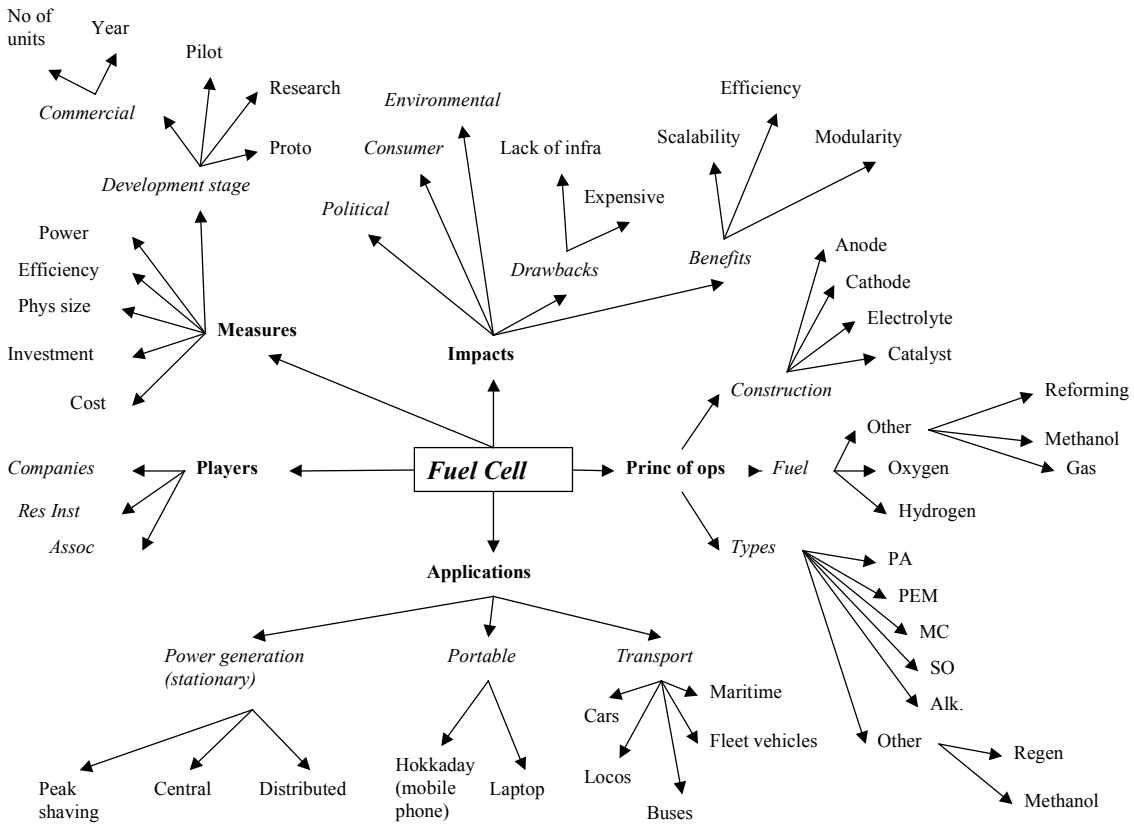


Figure 8-6 A taxonomy of the Fuel Cell domain

A major difference between the two models is that the terms in the document tend to be extensions or instances whereas many of the terms in the taxonomy are intensions or classes. The fuel cell document links "hydrogen" and "oxygen" directly to "fuel" and then to "fuel_cell". The human taxonomy also defines hydrogen as a "fuel" but inserts the concept "principles of operation" between "fuell_cell" and "fuel". This could be useful to structure the field but it is hard to learn the concept from the document itself. Three ways to address this can be considered although we have not tried these. The first is to try creating another piece of text describing the taxonomy of the field. This text could then be appended with the original document and be processed by BRIEFS to arrive at a better model. The second way would be to rewrite the document and be careful to include, at appropriate points, statements about how a thing should be classified. The third way is to accept the initial models created by the assistance of BRIEFS analysis and manually edit and complete it with additional classification, concepts and incidences. In practise one might choose a combination of these. Manual effort is unavoidable.

8.4 Studying Industries and Companies by Exploiting Relevance Evaluation

In this section we want to understand whether the proximity of things - concepts, matters or facts - can be assessed by evaluating how closely documents describing them are related or similar. The assumption is that documents containing many similarities describe things that are somehow related. The relevance evaluation exercises to be described in this section show how this idea could be exploited. The exercises are based on the relevance evaluation capability of the BRIEFS System. The thing here is a company or a business.

In relevance ranking one document is taken as the base or reference and its relations are calculated. The other documents to be ranked for relevance are then analysed for the same relations that are present in the base document. The more a document to be ranked contains important relations that are also important in the base document the more relevant it is deemed to be in the context of the base document. The resulting score is called Relevance Ranking Value (RRV). The RRV of the base document to itself is normalised to 100% and the normalised or relative RRVs of all other documents are calculated in proportion to the RRV of the base document.

In the following we describe two experiments. The first deals with strategic planning documents of a Finnish industrial company and the second with documents filed in the U.S.A. for Initial Public Offering (IPO).

8.4.1 Analysis of Strategic Plan Documents

8.4.1.1 Description

We experimented with relevance ranking using the strategic plan documents of a major Finnish industrial company. We call the company "Nordic". We had access to the strategic plan documents for the total Group and for its major divisions[17]. The divisional plans address topics such as the Business Idea, Market Outlook, Competitive Edge, Strategic Goals, Key Issues for Future Success, Main Strategies

[17] These plans are in text format but contain tables and figures. In our processes everything is treated as text. This then includes captions of tables and figures as well as headings of tables.

and Investments. The Group plan also addresses, at the corporate level, these topics and in addition it addresses topics such as the General Business Environment, Divisional Structure, Management Principles, Corporate Communication, Human Resources and IT. We also used some text from the annual reports of the company and the annual reports of one of their main competitors. This exercise is described in more detail in Keijola (1999). A summary is presented here.

We first performed for each document the kind of text analysis described in the previous section. Unfortunately it cannot be reported here due to its confidential nature. However, as a result of the analysis, profiles of the strategy documents were built. These profiles are based on the key (in practise most frequent) terms and the RMV values for all the relations of the key terms in a document. The profiles formed the basis for relevance evaluation.

As an example how relevance ranking could be applied and the results interpreted consider Table 8-1 in the following. We have taken the strategic plan statement of Business Line 1 (BL 1) as the base and ranked all the other statements for relevance to it. The table shows that the strategy statements of the Group and the Technology Unit are the most relevant to it whereas the statement of the other major Business Line (BL 2) is not very relevant in the context of BL 1. This result is probably as one would expect. The Group strategy statement reflects important relations, i.e. ideas, in the BL 1 statement. Technology is important in an engineering based industry and it should support businesses and their requirements. Assuming that the two business lines essentially are different Strategic Business Units (SBU) their relevance ranking should not show close relations. Should they show close relation then maybe they should not be treated as different SBUs.

Table 8-1 Relevance ranking with Business Line 1 (BL 1) as the base

Division	Relevance
Nordic Group	29.90 %
BL 1 (Relevance to itself)	100.00 %
BL 2	15.49 %
Service	16.93 %
Technology	30.91 %
Manufacturing	15.24 %
Support	7.87 %

Consider then the case where the Group statement is taken as the base. The corresponding relevance rankings are shown in Table 8-2.

Table 8-2 Relevance ranking with the Group as the base

Division	Relevance
Nordic Group (relevance to itself)	100.00 %
Business Line 1	14.36 %
Business Line 2	14.20 %
Service	22.41 %
Technology	27.91 %
Manufacturing	22.47 %
Support	14.14 %

Comparing the two ranking exercises above we note that the Group statement is more relevant in the context of the Business Line 1 statement (29,90 % of max) than the Business Line 1 statement is in the context of the Group statement (14,36 % of max). This could be explained by the richer use of words in the Group statement and the fact that the Group document covers a wider range of topics. Another explanation could come from the theory of firms. The result could indicate the holding company (bottom-up) nature of the firm: the Group reflects more thinking at the divisional level than the divisional thinking reflects thinking at the Group level. Important strategic matters (other than business portfolio) may flow more up than down.

8.4.1.2 Discussion

We also made some other studies with the Nordic case as described in Keijola (1999). The studies showed that relevance ranking can be used not only to find documents that are similar but also to also to study the closeness of the contexts implied by the text in the documents.

Statistical processing can also lead to interesting observations about the presence or absence of terms. E.g. one may note that the term "quality" is more present in the Annual Report of a North American competitive company than in the Annual Report of the Nordic Company. The Nordic Company now has two principal ways to respond to this observation. The first response is to launch a study to understand the reasons better, to go beyond the surface. The second response is to dismiss the result: "you talk about what you don't have", i.e. treat the competitive use of words as a kind of a

ploy. Both choices may be appropriate depending on what else is known about the situation. If little else were known then the author would recommend the first response.

The case shown here and its interpretation are but one possibility and one may have to be careful about the interpretation of the results. Further study would be needed to verify the interpretation. On the other hand, interesting, even important, questions worth pursuing could be raised in this manner.

Relevance evaluation could be extended to numerous types of documents: product descriptions, company descriptions and technology descriptions. Current search engines, such as Google[18], already offer services in this respect. The problem is that they offer similar documents for the user to peruse but they do not open up the reasons for the similarity or dissimilarity. BRIEFS, because of its transparent methodology, enables one to better understand why two documents have been deemed related or less related.

8.4.2 Analysing IPOs by Using Relevance Evaluation

The next relevance experiment to be described here is concerned with the question "Who form an industry?" More specifically the question we ask is "Do companies talking the same language form an industry?"

8.4.2.1 Data

Our data for relevance evaluation in this experiment includes 195 filings for Initial Public Offering (IPO) in the United States covering the period between the end of June 1999 and the end of September 1999. The list of the companies is in Appendix 3. The data was obtained from the IPO Express service of Edgar Online[19]. The IPO Express service sends to its clients an electronic mail every time an IPO is submitted to the Securities and Exchange Commission of the United States (SEC) and filed in their EDGAR (Electronic Data Gathering, Analysis, and Retrieval) system. The email sent by IPO Express gives an edited version of the IPO filing. Most notably the Risks

[18] www.google.com

[19] www.edgar-online.com

section of the IPO filing is shortened to headlines only. Editing does not change the language used in the IPO. As the basis for our experiments we have taken the one to three pages Company Description part of the email documents. This part is normally the Summary section of the IPO filing. Each one of the documents at a time was taken as the reference base (or Brief) and relevance evaluations of the other documents were performed.

IPO filings were chosen because we assume that professionals have written them. One can expect that they have been written with serious intentions in mind. They are expected to be truthful statements about the company and its intentions. Excessive rhetoric and outrageous claims are not possible due to strict SEC regulations and potential liability consequences. One possible drawback may be that often IPO professionals, investment bankers, write the IPOs. Thus the texts may be rather similar in style. On the other hand this could increase the comparability of the documents, as writing style is not a major distinguishing factor between documents.

8.4.2.2 The Relevance Evaluation Scheme

The scheme we have used for selecting the probe terms in a Brief is that we take a sufficient number of the most frequent terms such that their total use in the document constitutes at least 50% of total words in the document. It is assumed this ensures that all words in the document will participate in at least one relation.

The terms we have used have been in the morphological root form appended with part-of-speech tags. We chose this representation because it is not too restrictive and yet distinguishes between the verb and noun forms of the same surface representation (e.g. between *an* author and *to* author). An alternative would have to use the syntactic role with or without the part-of-speech but our studies indicated that this would not have materially changed the results.

We have run relevance evaluations for the total set of 195 documents. We set the normalised relevance for the current Brief document to itself as 100% and normalised the others in proportion based on the Brief's RRV for self-relevance.

The results of the evaluation runs were organised into a matrix where the columns represent the reference companies (Cr-company) and the rows the companies to be evaluated for relevance (Ce-company). A single column in the result matrix indicates how close the Ce-companies are to a particular Cr-company as judged in terms and relations of terms that seem significant in the context of the Cr-company. A single row in turn indicates how close a particular Ce-company is to the Cr-companies measured in terms of the individual Cr-companies. Note that the relevance measure is not symmetric.

8.4.2.3 Description of Case Allied Riser

The IPO filing also has some structured information. Most importantly in our case it contains the Standard Industry Code (SIC)[20] classification (This code is now in the process with being replaced by the North American Industry Classification System, NAICS introduced in 1997). With the help of the SIC code and relevance ranking we hope to see whether the texts of companies in the same or related industries do cluster.

In this case we use as the reference document the IPO filing of a U.S. telecom company called Allied Riser Communications. The summary result of the relevance evaluation exercise is shown in Figure 8-7. The x-axis shows the normalised relevance ranking measure in relation to the reference document and the y-axis shows the SIC for the 195 companies that were evaluated.

[20] See http://www.census.gov/epcd/www/naics.html

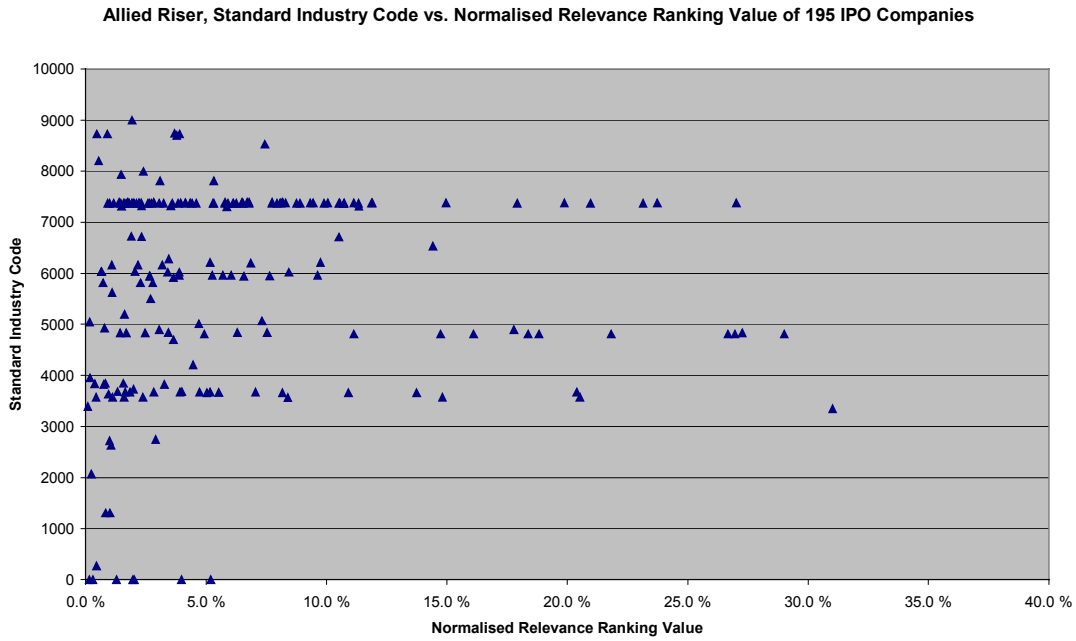


Figure 8-7 Normalised relevance ranking of 195 IPO companies to the Allied Riser Communications company by Industry. X-axis shows the normalised relevance ranking score and Y-axis shows the Standard Industry Code category. Each dot represents the position of one company.

The SIC code for Allied Riser is 4813, Telecom Operators, and one can see some clustering and high normalised relevance there. Not all but some companies in the 4813 industry write their IPOs in terms and relations frequently used by Allied Riser. In addition one can also see some high relevance in the 3000 range and in the 7300 range. Why would this be so?

Table 8-3 lists the 12 companies which scored more than 20% normalised relevance. (The cutoff 20% was chosen rather arbitrarily primarily to limit the number of companies.) The table shows the name of the company, a short descriptive of it as stated in the IPO, the normalised relevance score and the SIC. Explanations of the SIC codes are shown in Table 8-4. Looking at the results we note that companies in eight different SIC-industries scored high relevance with reference to Allied Riser.

Table 8-3 Companies with over 20% normalised relevance to Allied Riser.

Company	Description	Normalised Relevance	SIC
Allied Riser Communications Corp	A facilities-based provider of broadband data, video and voice communications services to small- and medium-sized businesses in major metropolitan areas in the United States.	100.0 %	4813
GRIC Communications Inc	Provider of IP-based products and services such as Internet telephony and Internet roaming to telecommunications service providers, Internet service providers and other emerging communications service providers.	31.0 %	3344
BTI TELECOM CORP	A facilities-based integrated communications provider in the southeastern United States.	29.0 %	4813
Pac-West Telecomm Inc	Provider of integrated communications services in the western United States.	27.3 %	4832
comstar.net Inc	An Internet service provider, or ISP, that targets middle market businesses, educational institutions and governmental organizations.	27.0 %	7379
PentaStar Communications Inc	Design, select and implement communications services solutions that best meet our customers' specific requirements and budgets.	27.0 %	4813
iBasis Inc (VIP Calling Inc)	Provider of Internet telephony services.	26.7 %	4813
FASTNET Corp	An Internet service provider targeting small and medium sized enterprises in selected high growth markets in the mid-Atlantic area of the United States.	23.7 %	7379
EGAIN COMMUNICATIONS CORP	Provider of customer service infrastructure solutions for companies engaged in electronic commerce.	23.1 %	7372
GOLDEN TELECOM INC	A Russian facilities-based provider of integrated telecommunications services.	21.8 %	4812
DALEEN TECHNOLOGIES INC	Provider of billing and customer care software for integrated communications providers.	21.0 %	7372
SYCAMORE NETWORKS INC	Developer and marketer of software-based optical networking products that enable network service providers to provide bandwidth and create new high speed data services.	20.5 %	3576
Next Level Communications Inc	Provider of broadband communications systems. A subsidiary of General Instrument Corp. (NYSE:GIC).	20.4 %	3674

Table 8-4 Selected SIC codes

Code	Description
3344 (is not in SIC but is in NAICS)	Semiconductor and Other Electronic Component Manufacturing
3576 (?)(Not in SIC nor in NAICS)	?
3674 (SIC)	Semiconductors and Related Devices
4812 (SIC)	Radiotelephone Communications
4813 (SIC)	Telephone Communications, Except Radiotelephone
4832 (SIC)	Radio Broadcasting Stations
7372 (SIC)	Prepackaged Software
7379 (SIC)	Computer Related Services, NEC (Not Elsewhere Classified)

Perusing the IPO documents of the individual companies we can make observations about the potential business relationship between Allied Riser Communications and the companies. We can also consider whether the SIC is appropriate for a company. These observations are summarised in Table 8-5.

Table 8-5 Observations about the relationship of the top 20 relevance companies to Allied Riser Communications. Author's comments in *italics.*

Company	Description and *Comments*	Is the SIC OK?
Allied Riser Communications Corp	A facilities-based provider of broadband data, video and voice communications services to small- and medium-sized businesses in major metropolitan areas in the United States.	4813 OK
GRIC Communications Inc	Provider of IP-based products and services such as Internet telephony and Internet roaming to telecommunications service providers, Internet service providers and other emerging communications service providers. *Does not compete with Allied Riser. Could provide service to them.*	3344 Should be 4899 Communications Services
BTI TELECOM CORP	A facilities-based integrated communications provider in the southeastern United States. *May compete locally with Allied Riser*	4813 OK
Pac-West Telecomm Inc	Provider of integrated communications services in the western United States. *May compete locally with Allied Riser*	4832 Should be 4813

Company	Description and *Comments*	Is the SIC OK?
comstar.net Inc	An Internet service provider, or ISP, that targets middle market businesses, educational institutions and governmental organizations. *Could be customer of Allied Riser*	7379 OK
PentaStar Communications Inc	Design, select and implement communications services solutions that best meet our customers' specific requirements and budgets. *Could be complementor to Allied Riser*	4813 Should be e.g. 8711 Engineering Services
iBasis Inc (VIP Calling Inc)	Provider of Internet telephony services. *Could be compete or be supplier of international services to Allied Riser*	4813 OK
FASTNET Corp	An Internet service provider targeting small and medium sized enterprises in selected high growth markets in the mid-Atlantic area of the United States. *Could compete with or complement Allied Riser*	7379 OK
EGAIN COMMUNICATIONS CORP	Provider of customer service infrastructure solutions for companies engaged in electronic commerce. *Does not compete with Allied Riser but could complement*	7372 OK but could also be 7379
GOLDEN TELECOM INC	A Russian facilities-based provider of integrated telecommunications services. *Does not compete with Allied Riser*	4812 OK but could also be 4813
DALEEN TECHNOLOGIES INC	Provider of billing and customer care software for integrated communications providers. *Could be a supplier to Allied Riser*	7372 OK
SYCAMORE NETWORKS INC	Developer and marketer of software-based optical networking products that enable network service providers to provide bandwidth and create new high-speed data services. *Could be supplier to Allied Riser*	3576 Wrong, could be e.g. 3669 Communications Equipment, NEC
Next Level Communications Inc	Provider of broadband communications systems. A subsidiary of General Instrument Corp. *Could be supplier to Allied Riser*	3674 could be e.g. 3669 Communications Equipment, NEC

8.4.2.4 Discussion of the Allied Riser Case

We note from Table 8-3 and Table 8-5 which have been presented above, that companies do have similarities in their terminology and emphasis because they are in the same industry and therefore address same or similar markets, customer segments, products, technologies and so on. One could even suspect that similar companies operating in the same geographic areas are competitors. Affinity between the terminology used by companies could arise also because the companies are in a customer-supplier or a supplier-customer relationship or in some complementary relationship and thus share some language.

We also note that the assigned SIC code may not be appropriate for a company. There could be several reasons for this. First, a company may operate in several industries and a single code is thus not descriptive enough. Secondly, the code can be downright wrong. This in turn could be because the company has migrated from one industry to another over time but the code has not followed this transition. The other possibility is that the code just has been assigned erroneously. The transition from SIC to NAICS also seems to cause some confusion.

8.4.2.5 Description of Multiple Companies Case

As a further study case we chose from the large matrix of 195 companies a submatrix of Cr-companies that were classified as being in the Telecom Operator (SIC 481x, 11 companies), in the Financial Services (SIC 6xxx, 17 companies) or in the IT Services (SIC 7379, 8 companies) industry, 36 companies in all. This selection was done to keep the numbers manageable. The companies represent 15 different industries at the 4 digit level of the SIC code. The companies are listed in Table 8-6.

An "helicopter view" to the relevance profiles of the chosen companies is shown in Figure 8-8. A "squibbly" line joining the normalised relevance values of all the 195 Ce-companies to one Cr-company represents each of the 36 references. The telecom operator companies are in the lower part, the financial services companies in the middle and the IT Services companies are in the upper part of the graph. The high peaks show the relevance of a company to itself. The clusters are clearly distinguishable to the human eye, they have been purposefully arranged by the author. We now need to answer the question "are the clusters identifiable with statistical

methods?". To answer this question we used the SPSS statistical analysis program package and deployed a standard hierarchical clustering scheme to the relevance profiles of the selected Cr-companies whereby we increased gradually the maximum number of clusters. The results are shown in Table 8-6.

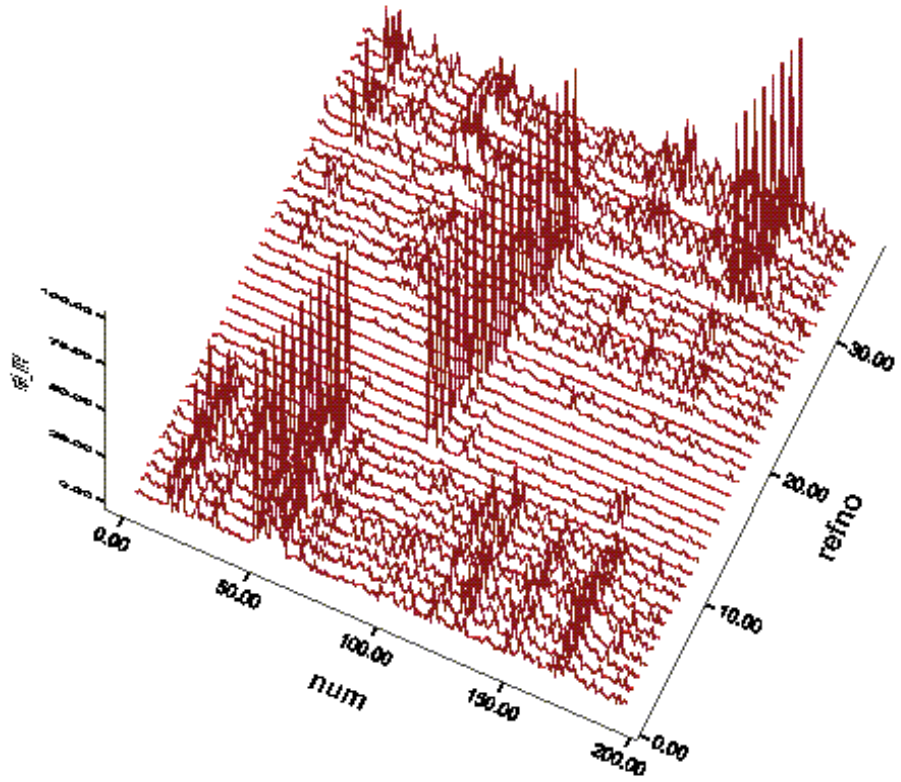


Figure 8-8 Formation of industry clusters (1). The categorical "refno"-axis identifies the reference companies (Cr, listed in Table 8-6) the categorical "num"-axis identifies the companies evaluated for reference (Ce, listed in Appendix 3) and the "z"-axis the normalised relevance ranking values of the Ce-companies. The high peaks denote the normalised relevance of a Cr-company to itself (which is 100%)

Table 8-6 Formation of industry clusters. Columns show the number of clusters requested and the numbers within columns indicate the number of the cluster wherein a company is assigned. Names of companies have been truncated for clarity of table.

Company			Number of clusters requested														
Refno	Num	SIC and Name	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
1	49	4812_GOLDEN_TELECOM_INC	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	50	4812_Triton_PCS_Holdings_Inc	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	51	4813_Allied_Riser_Communication	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	52	4813_BTI_TELECOM_CORP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	53	4813_Communication_TeleSystem	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	54	4813_deltathree.com_Inc	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	55	4813_iBasis_Inc_(VIP_Calling_Inc)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	56	4813_Illuminet_Holdings_Inc	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1
9	57	4813_OMNILYNX_COMMUNICATI	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	58	4813_PentaStar_Communications_	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	59	4813_WORLDQUEST_NETWORK	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2
12	89	6021_Coastal_Banking_Company_	5	5	5	4	4	4	4	4	4	4	3	3	3	2	2
13	90	6021_GREENVILLE_FIRST_BANC	5	5	5	4	4	4	4	4	4	4	3	3	3	2	2
14	91	6021_LEHIGH_ACRES_FIRST_NA	5	5	5	4	4	4	4	4	4	4	3	3	3	2	2
15	92	6035_MFS_Financial_Inc	6	6	6	5	5	5	5	5	5	5	4	4	3	2	2
16	93	6035_Security_Financial_Bancorp_	6	6	6	5	5	5	5	5	5	5	4	4	3	2	2
17	94	6036_AMERICAN_FINANCIAL_HC	6	6	6	5	5	5	5	5	5	5	4	4	3	2	2
18	95	6159_FIDELITY_LEASING_INC	7	7	7	6	6	6	6	6	6	5	4	4	3	2	2
19	96	6162_AMERICAN_HOME_MORTG	6	6	6	5	5	5	5	5	5	5	4	4	3	2	2
20	97	6162_Auto_Credit_Acceptance_Ltd	8	8	8	7	7	7	7	7	5	5	4	4	3	2	2
21	98	6200_ALARON.COM_HOLDING_C	9	9	9	8	8	8	8	8	7	6	5	2	2	2	2
22	99	6211_Empire_Financial_Holding_C	10	10	10	9	9	9	9	8	7	6	5	2	2	2	2
23	100	6211_Web_Street_Inc	10	10	10	9	9	9	9	8	7	6	5	2	2	2	2
24	101	6282_NEUBERGER_BERMAN_IN	11	11	10	9	9	9	9	8	7	6	5	2	2	2	2
25	102	6531_HOMESERVICES.COM_INC	12	12	11	10	9	9	9	8	7	6	5	2	2	2	2
26	103	6711_MAIN_STREET_BANKS_INC	12	12	11	10	9	9	9	8	7	6	5	2	2	2	2
27	104	6719_John_Hancock_Financial_Se	11	11	10	9	9	9	9	8	7	6	5	2	2	2	2
28	105	6720_LCM_Internet_Growth_Fund_	13	13	12	11	10	5	5	5	5	5	4	4	3	2	2
29	166	7379_AGENCY.COM_Ltd	14	14	13	12	11	10	1	1	1	1	1	1	1	1	1
30	167	7379_Andover.net	15	15	14	13	12	11	10	9	8	7	6	5	4	3	2
31	168	7379_comstar.net_Inc	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
32	169	7379_DATA_RETURN_CORP	16	14	13	12	11	10	1	1	1	1	1	1	1	1	1
33	170	7379_eSpeed_Inc	9	9	9	8	8	8	8	8	7	6	5	2	2	2	2
34	171	7379_FASTNET_Corp	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35	172	7379_KEYNOTE_SYSTEMS_INC	16	14	13	12	11	10	1	1	1	1	1	1	1	1	1
36	173	7379_NAVISITE_INC	16	14	13	12	11	10	1	1	1	1	1	1	1	1	1

8.4.2.6 Discussion of the Multiple Industries Case

Based on the Allied Riser exercise we expected some relation between the Telecom Operator and the IT Services industry but little between them and the Financial Services industry. As can be seen from Table 8-6 there is clear formation into clusters by industry. A notable example are the savings banks (SIC 6021) which form a cluster of their own already at the level of five clusters. Already at the level of four clusters only few of the companies in the financial sector are still assigned to the same cluster with either a telecom or an IT services company or vice versa.

The separation between the IT services and the telecom operator sectors is not as distinguished as between the financial sector and the other sectors. One reason to this could be that the companies in both sectors write about the IP (the Internet Protocol) and the Internet. This causes confusion. E.g. persistently two of the IT services companies, comstar and FASTNET, are incorrectly assigned to the same cluster with telecom operator Communication Telesystems. On the other hand the IT services company eSpeed is justifiably assigned to the same cluster with the financial services company Alaron.com. Both offer electronic on-line trading of securities.

An interesting future study would be to experiment with the total set of 196 companies.

8.4.3 Summary of Relevance Ranking

The SIC code has been a central classifying factor in studies of industries. Its problems have been well-recognised e.g. in Powell (1996) and McGahan and Porter (1997). Powell (1996) notes that some 4-digit SIC codes identify exceedingly narrow industry niches, the classification is not consistent and that they aggregate firms that do not compete at all. Our studies show that qualitative analysis of company documentation, combined with some background data such as geographic coverage, may serve to better identify industries and competitive situations. Further, it may be used to recognise even supplier-customer or complementary relations. The results are not necessarily crystal clear but they could pose intriguing questions to an inquiring mind.

Further study is needed in the detailed workings of the algorithms and in the details of the results, however. For instance it is not clear what would be the appropriate number of clusters to assign. There are also questions related to the varying lengths and styles of documents etc.

8.5 Studying Industries and Companies by Exploiting Information Extraction

8.5.1 The Fuel Cell Deals Experiment

8.5.1.1 Description

The objective of this exercise, performed in 1999, was to test the business hypothesis that "the fuel cell technology is receiving rapidly increasing attention". We conducted, with the first version of our system, a test where we processed all the 1210 news items about fuel cells from 1991 to early 1999 that were stored in the archives of the Reuters Business Briefing service. The news items were to contain at least one of the words "contract", "agreement" or "order". From the instances in the news that seemed to indicate such a deal made we filled in a template with extracted information about the participants of the deal, the type of deal, the object of the deal, and the amount of the deal. We then tabulated the resulting templates, i.e. the templates that our system had been able to at least partially fill.

The numbers of the deal templates extracted by year are shown in Figure 8-9. As can be seen the results seem to confirm our hypothesis that fuel cell technology is maturing, and that interest in it and its commercialisation are gathering momentum.

We also tabulated the average value of the contract amount by year. According to the chart that is shown in Figure 8-10 this result seems to further confirm our hypothesis. The numbers of deals are increasing annually and the average size of a deal is increasing at same time.

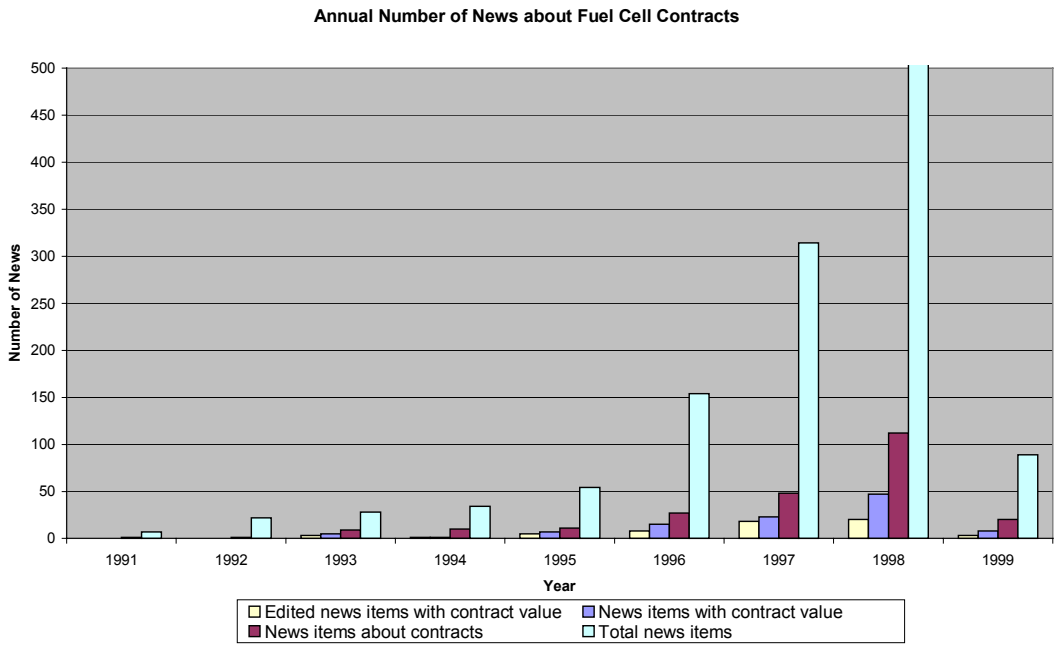


Figure 8-9 Number of news about fuel cell contracts by year over from 1991 to early 1999 in the archives of Reuters Business Briefing. Editing means manually removing duplicate news items.

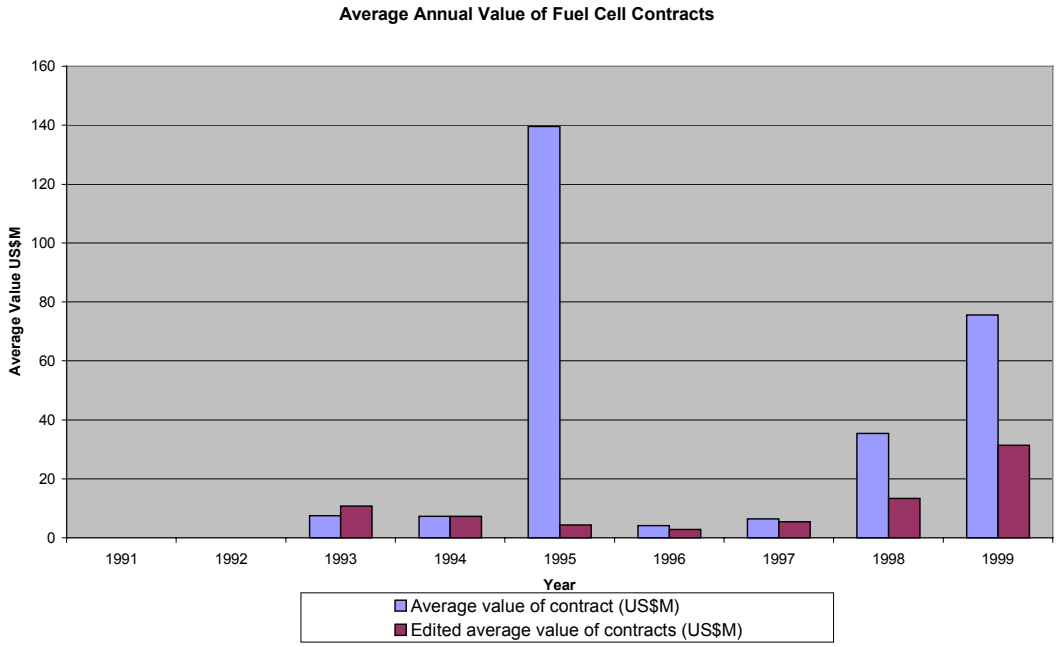


Figure 8-10 Average value (in US$M) of a fuel cell contract. Editing means manually taking out clearly erroneous data, and contracts in which fuel cells form a minor part. E.g. in 1995 there was a major contract for a submarine that also contained fuel cells.

8.5.1.2 Discussion

We have shown in this section a simple application of information extraction that could be useful, assuming one is interested in entering the fuel cell industry or exploiting the emerging technology. It is not hard to consider uses in other industries, too. There are technical issues that need to be understood better but we defer the discussion of these until we have described another information extraction exercise.

8.5.2 The Wireless Application Protocol Exercise

8.5.2.1 Description

The Wireless Application Protocol (WAP) exercise is an extension of the fuel cell deals exercise shown in the previous section. It has to do with news concerning the WAP server software industry. The objective of the exercise was to build a picture of the players and the deal activities in the industry. Details of the exercise have been reported in Keijola (2000)

The task was to extract information related to the entities and their relations in the industry according to the data model depicted in Figure 8-11. The data source has been 1252 reports off the Dow Jones WAP-related News Service during the period 10.5.1999 - 30.4.2000.

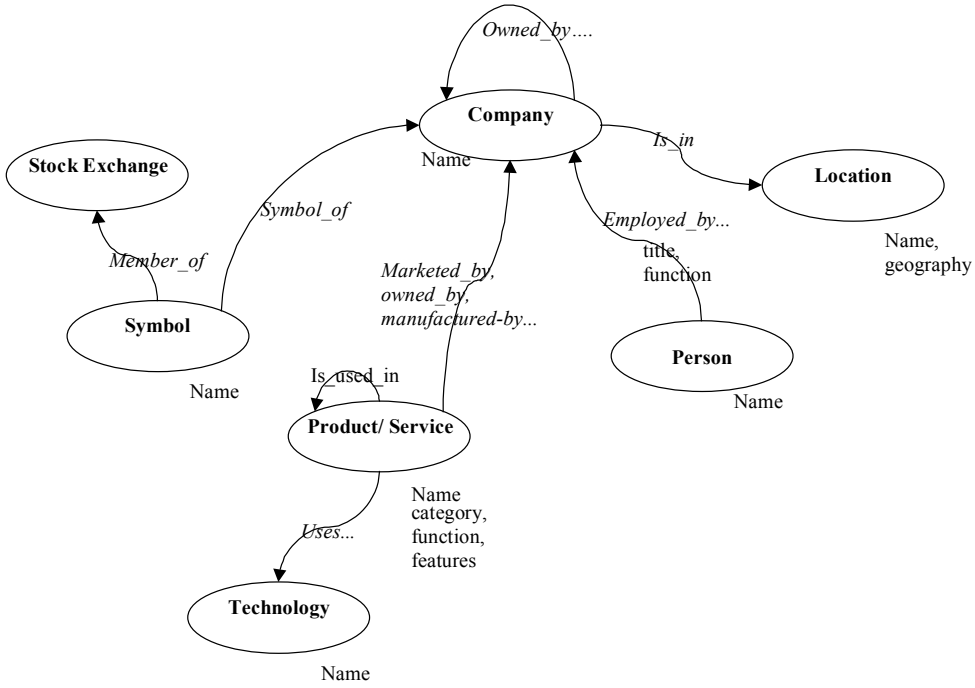


Figure 8-11 Knowledge structure of WAP server software relations

8.5.2.2 Information Extraction

8.5.2.2.1 Named Entities

The following numbers of names of the players and other entities present in the news data were extracted (Table 8-7).

Table 8-7 Number of extracted names

Entity	Number of Names
City	243
Company	2583
Country	92
Stock Exchange	20
Monetary unit	41
Nationality/Language	68
Not-for-profit organisation	112
Person	1650
Product	901
Stock Exchange symbol	230
Technology or standard	406

Figure 8-12 shows the accumulation of new names as a function of the news items processed. The increase has been linear. One would expect, however, that over time the growth would cease to be linear and will change to logarithmic instead.

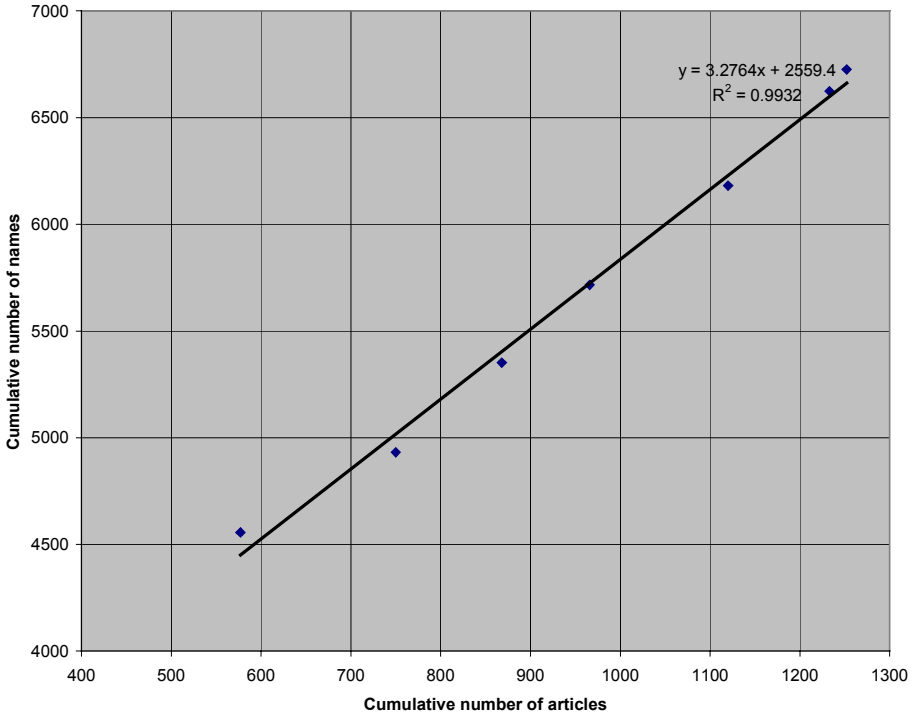


Figure 8-12 Accumulation of new Names in the BRIEFS WAP Pilot

8.5.2.2.2 Semantic Categories

A number of semantic categories (sem) were defined for the domain. These included

- SEM-CONTRACT: nouns indicating a contract: agreement, contract, order
- SEM-CONTRACT-ACTION: verbs indicating contracting activity: announce, award, finalise, place, receive, secure, sign, win
- SEM-GEOGRAPHY: includes Names for which the Name subtype is one of : country, nationality, region
- SEM-MAKEVERB: verbs indicating making of a product: make, manufacture, produce
- SEM-ORGANISATION: includes Names for which Name subtype is one of: company, organisation
- SEM-PRODUCT: nouns indicating a product in the domain: product, phone, software, display
- SEM-SALESVERB: verbs indicating a sales event: offer, provide, deliver
- SEM-SERVICE: nouns indicating a service: service, web-site

8.5.2.2.3 Template Elements

Template elements collect information about an entity or concept. The following mplate Elements were defined for the WAP domain. For each element the number of rules used to extract information is given. All template elements, template relations and scenario templates have a common part as follows:

1. Type of template element, relation or scenario
2. Identification of the WAP-Brief
3. Date filled
4. ID of source of extraction
5. Date of source
6. Place of source

The template elements are

- TE-COMPANY (1 rule) collects information about a company or an organisation. It consists of the following fields
    - Name of the company or organisation
- TE-LOCATION (3 rules) collects information about geographical entities. It consists of the following fields
    - Name of city
    - Geography: country, nationality or region
- TE-PERSON (1 rule)
    - Name of person
- TE-PRODUCT (18 rules)
    - Name of product
    - Category of the product: hardware, software, …
    - Subcategory of the product: phone, display
- TE-STOCK-EXCHANGE (2 rules)
    - Name of Stock Exchange
- TE-SYMBOL (2 rules)
    - Stock symbol of company
- TE-TECHNOLOGY (1 rule)
    - Name of technology

8.5.2.2.4 Template Relations

Template relations collect information about the relations of template elements. The following template relations were defined for the WAP domain.

- TR-EMPLOYED-BY (16 rules)
  - ID of TE-PERSON
  - ID of TE-COMPANY
  - Title of person
  - Function of person
- TR-LOCATED-IN (4 rules)
  - ID of TE-COMPANY
  - ID of TE-LOCATION
- TR-OWNED-BY (3 rules)
  - ID of TE-COMPANY (company owned)
  - ID OF TE-COMPANY (owning company)
- TR-MANUFACTURED-BY (3 rules)
  - ID of TE-PRODUCT
  - ID of TE-COMPANY
- TR-MARKETED-BY (1 rule)
  - ID of TE-PRODUCT
  - ID of TE-COMPANY
- TR-MEMBER-OF (1 rule)
  - ID of TE-SYMBOL
  - ID of TE-STOCK-EXCHANGE
- TR-SYMBOL-OF (1 rule)
  - ID of TE-SYMBOL
  - ID of TE-COMPANY

8.5.2.2.5 Scenario Templates

Scenario Templates are intended to collect information about events in which one or more entities participate. The following scenario template was defined for the WAP domain.

- ST-DEAL (55 rules)
  - ID of TE-COMPANY (Company 1)
  - ID of TE-COMPANY (Company 2)
  - Type of deal:

    Partnership, Shareholding, Joint Venture, Alliance, Licensing, Cross-licensing, Piloting agreement, Marketing, Distribution, Sales contract
  - Purpose/objective of deal: text
  - Size of deal

8.5.2.3 The BRIEFS WAP Database

The results of the WAP Information Extraction were stored in an Oracle SQL database (Later we switched to using MySQL). The database was structured as depicted in Figure 8-13. The Template Elements, Template Relations and Templates are each stored in separate tables. From these three tables there is a pointer to the fourth table where the original documents are stored.

The database consists of 57654 Template Elements, 3559 Template Relations and 776 Scenario Templates extracted out of 1287 articles. Detailed distribution of the instances in the database is shown in Table 8-8 and Table 8-9.

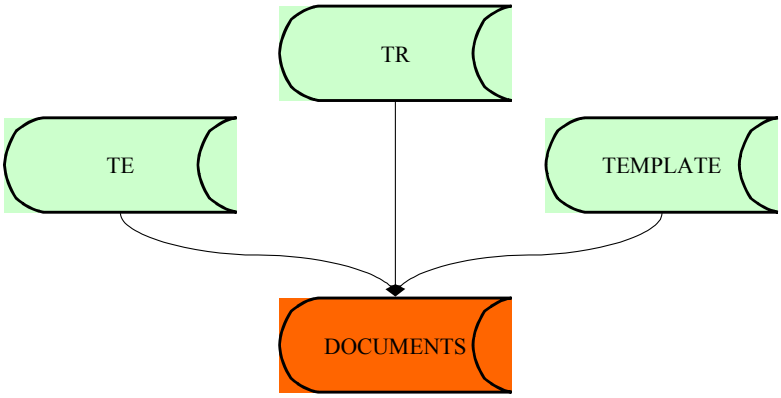


Figure 8-13 WAP Oracle SQL Database. TE = Template Element, TR = Template Relation, Template = Scenario Template

Table 8-8 Distribution of instances in the TE and TR tables

Type of Instance	Number of Instances
TE-COMPANY	18060
TE-EXCHANGE	312
TE-LOCATION	5099
TE-OBJECT	2120
TE-PERSON	2701
TE-PRODUCT	4734
TE-PURPOSE	9706
TE-SYMBOL	319
TE-TECHNOLOGY	14603
TR-EMPLOYED-BY	1402
TR-LOCATED-IN	1183
TR-MADE-BY	459
TR-MEMBER-OF	218
TR-OWNED-BY	2
TR-SYMBOL-OF	295

Table 8-9 Distribution of deal types in the WAP Templates table

Type of Deal	Number of Deals
Alliance	2
Distribution	2
Joint Venture	1
Licensing	52
Partnership	235
Sales	452
Shareholding	32

8.5.2.4 Making Use of the BRIEFS WAP Database

Since the extracted data is stored in an SQL database it can be queried and manipulated in many ways. In this section we show examples of some queries and show how the results could be visualised.

8.5.2.4.1 Queries about Presence of a Template Element in the News

A simple query would be to find out how often a particular Template Element (a person, a product, a company, …) is found in the WAP news. Figure 8-14 shows the results of a query about the appearance of person "Pertti Lounamaa" in the news. Notice that a misspelled version of the name has been detected and has also been selected. (In fact the same person is also identified by surname only). By clicking on a particular value of the histogram the original documents can be accessed.

This kind of chart could be used to e.g. track the newsworthiness of statements by a person (own or competitive), newsworthiness of existing or emerging technologies etc.

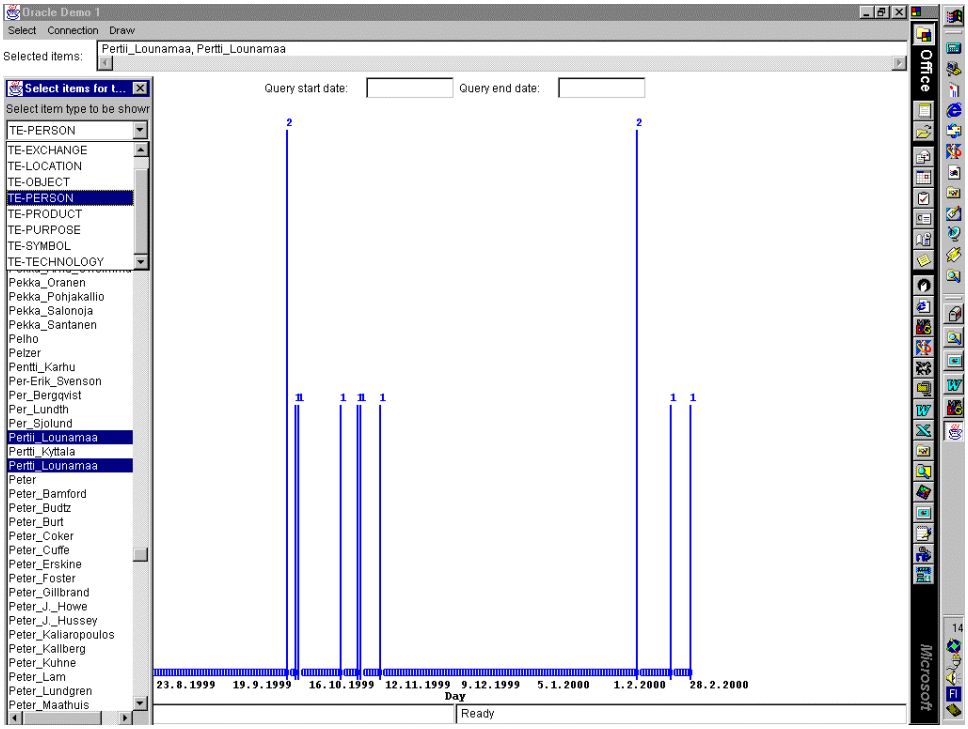


Figure 8-14 Frequency Query. The chart shows by date how many times the chosen Table Elements have appeared in the WAP news. The user chooses the type of Element, PERSON in this case, and the Element(s), Pertti Lounamaa in this case.

8.5.2.4.2 Queries about Relationships

The database can also be queried for detected relationships between the Table Elements. Figure 8-15 shows the results of such a query. The query is "who makes the product Aspira?". The resulting list shows all the report instances where the "made-by" relation for Aspira is detected. The results show that Motorola makes Aspira, in fact it is the name of their mobile architecture.

This kind of query could be used to learn about new or existing relationships between products and technologies, products and marketers, pensions and companies etc.

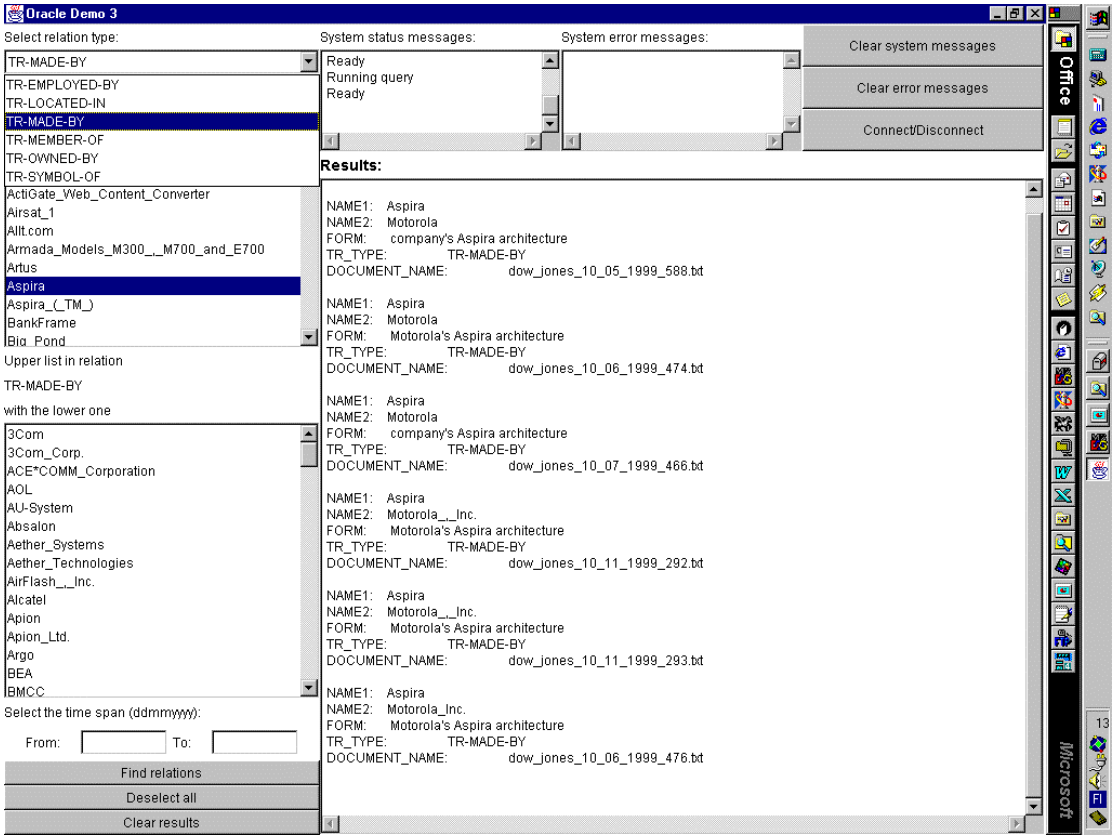


Figure 8-15 Relationships between Template Elements. The user defines the type of relationship, MADE-BY in this case, and the Template Element(s), Aspira in this case, for which relations are sought.

8.5.2.4.3 Queries about Deals

The Scenario Templates about deals between companies can be queried and e.g. the webs of relationships that a company forms with other companies can be detected and visualised. Figure 8-16 shows the results of such a query. The figure depicts reported deals where the 3Com company is a partner. By extending the web to the deals that the second parties to 3Com have in turn made with third parties the web shown in Figure 8-17 results. By clicking on a particular connection the associated original document can be retrieved as Figure 8-18 shows.

This kind of visualisation could have its uses e.g. in competitive intelligence, in the evaluation of potential partners, and in understanding the structure of an industry. For instance in this WAP case Figure 8-17 in fact reveals the essential structure of the WAP Server Software industry. There are two central players: the Phone.com company, who primarily targeted telecom operators and Nokia, who primarily targeted large corporations.

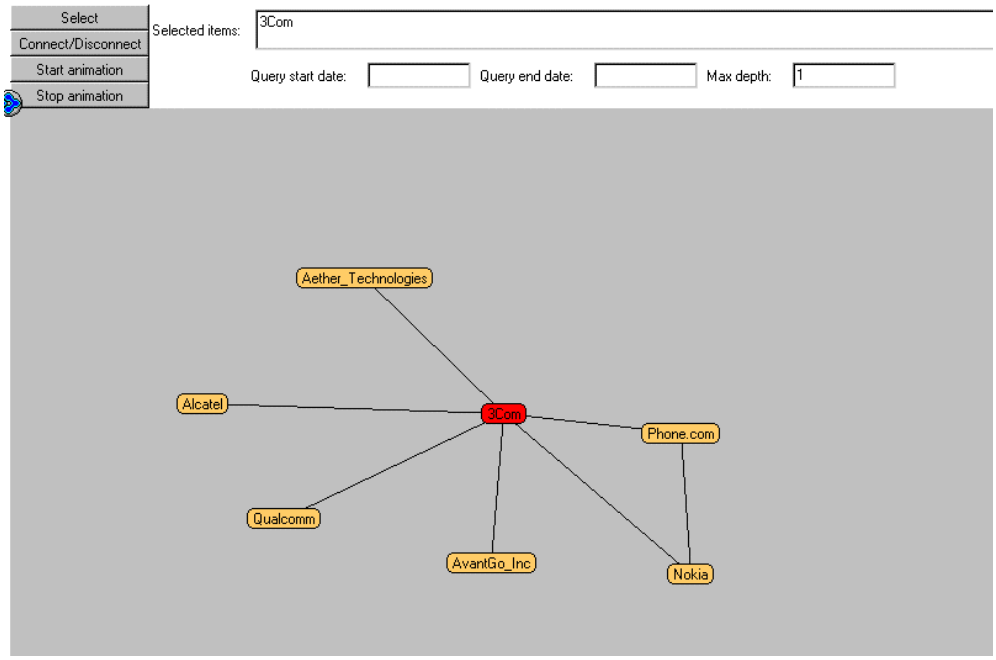


Figure 8-16 Web of Deals between Companies. The user chooses name of central company, in this case 3Com.

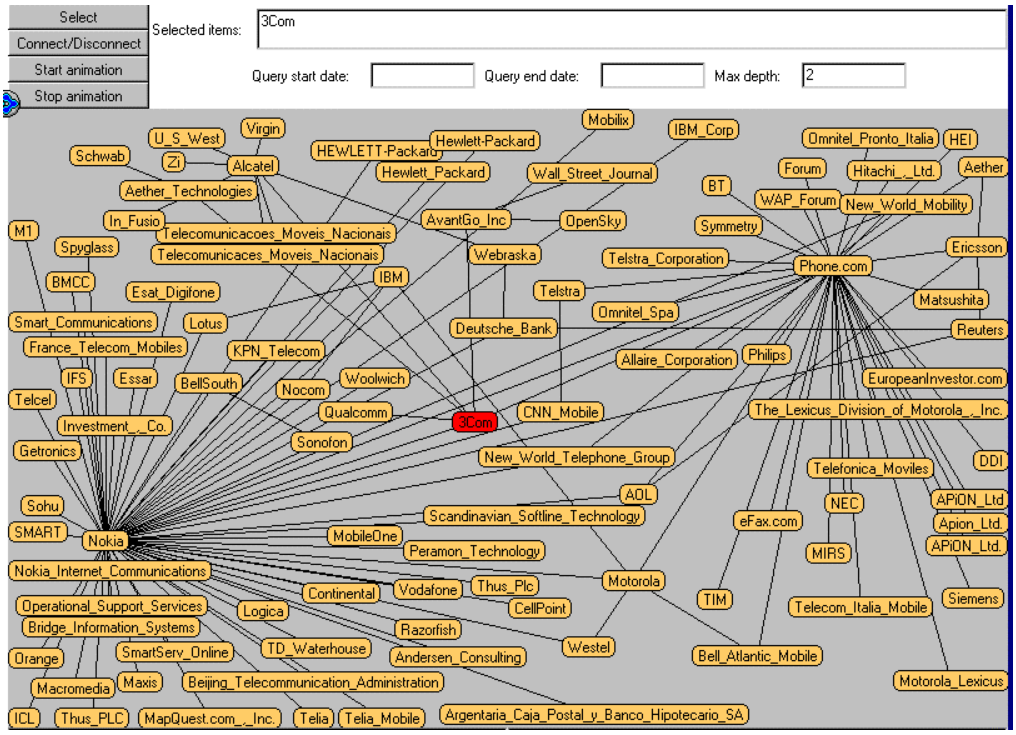


Figure 8-17 Webs of Deals starting with 3Com and extended to third parties.

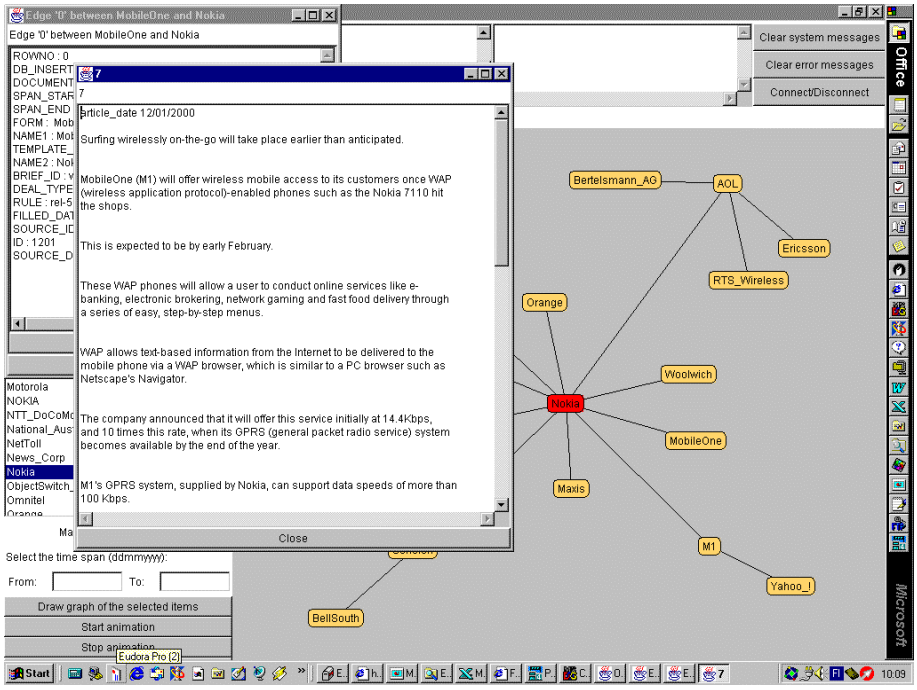


Figure 8-18 Webs of Deals, Original Article about a Particular Deal Has Been Requested. In this case Nokia has been chosen was the centre company.

8.5.2.5 Discussion

We have also conducted deal type experiments in other industries, e.g. electronic contract manufacturing, telecom operator, industrial maintenance services and steel processing industries. The results of these studies have not yet been systematically documented. These results have been similar to the study discussed in this section but also significant differences have been noticed. For instance, there are differences in the distribution of the types of deals between industries. In the WAP industry the majority of the reported deals were of type licensing of technology, establishing a development partnership or just plain sales contracts. These were expressed in a rather straightforward manner. In the steel industry, on the other hand, the deals are more complicated. They involve joint projects, creation or update of processing facilities, securing source of raw material and so on. In the electronic contract manufacturing industry the deals are about outsourcing and investments in production facilities. The structures of the industries also differ. Such pronounced bipolar industry as the WAP server software industry was not found in the other industries we tried.

Finally, one should acknowledge that although the results about the WAP deals seem plausible they could on the other hand merely reflect purposefully selected source

material. More news about Nokia and Phone.com could have been filtered in and news about other companies filtered out in the set of news items processed. Turning this into a positive consideration we could say that we now have a way to question the validity of the source material.

8.5.3 Technical Evaluation of Information Extraction

How good is our information extraction capability? We do not want to dig too deep in the technical details as it is not purpose of this research but we highlight some important issues and considerations.

Extracted information is the result of a long refinement chain of text and problems do occur at all levels. Starting with the basic linguistic level the parsers are not perfect. The very first step is tokenisation, the determining of where a word starts and ends. Even this phase is not without problems. The morphological and part of speech features of words are normally determined accurately. Simple sentences are also parsed correctly. Complicated sentences are not necessarily parsed correctly, however. Capitalised headlines capture the essence of news and are thus a good source for information extraction but capitalisation and the fact that they may not form proper sentences confuses the parsers. Identification of proper names is at a good level but the classification of names has its problems. E.g names of persons and names of companies containing a person name can be problematic. Ericsson is good example. The granularity of the classification of names is not necessarily sufficient. Surface forms of the names of an entity are not standardised. There are referential problems. E.g. the IBM company might be referred to as Int'l Bus Mach, International Business Machines, International Business Machines Corp., "it", "they", "the company", "the Big Blue" etc. Then there are numerous IBM companies specialising in something or operating in a particular geographic region. These could be referred to in the text just by IBM or "the IBM company". Problems arise if sometimes IBM refers to the IBM Corporation and sometimes to an IBM entity in the same piece of text. Some entities such as factories do not often have proper names. They are typically referred to by the location, e.g. "the East Fishkill facility" or the "semi-conductor plant at East Fishkill". The semantic categorisation may be ambiguous. The extraction rules can be ambiguous or faulty and the rule sets incomplete. All of these issues have been somewhat addressed in our system. The issues have not gone

completely away, though. In fact they may never go. Should they go machines would exceed human performance.

In information extraction the specific technical success measures used are recall and precision (see e.g. Pazienza (1997)). *Recall, R,* measures what proportion of all the right answers have been obtained and *precision, P,* measures what proportion of all the answers obtained have been correct ones. The *F-measure* combines these two. Mathematically they can be expressed as follows

$$R = \frac{N_{correct}}{N_{key}} \qquad \textbf{(Equation 8-1)}$$

$$P = \frac{N_{correct}}{N_{correct} + N_{incorrect}} \text{ ,} \qquad \textbf{(Equation 8-2)}$$

where

$N_{correct}$	is the number of correct answers obtained
$N_{incorrect}$	is the number of incorrect answers obtained
N_{key}	is the number of correct answers in the corpus

The combined F-measure is calculated from recall and precision according to

$$F(\beta) = \frac{(\beta^2 + 1) \cdot P \cdot R}{\beta^2 \cdot P + R} \text{ ,} \qquad \textbf{(Equation 8-3)}$$

where the coefficient β determines the weighting of recall and precision: with $\beta > 1$ the measure weights recall more than precision and with $\beta < 1$ less than precision. Three values of F-measure often occur in the literature: *F(1)* which is often written as *P&R*, *F(2)*, written as *P&2R*, and *F(0.5)*, in the form *2P&R*. Appelt and Israel (1999) claim that the state-of-art in information extraction seems to have plateaued at around 60% of human performance. The summary results of past Message Understanding Conferences (MUC) are shown in Table 8-10

Table 8-10 Results of Past Message Understanding Conferences (Chincor (1998))

Conference	Year	Domain	Highest F-measure
MUC-4	1992	Terrorist Attacks	55.93%
MUC-5	1993	Joint Ventures	52.75%
MUC-6	1995	Changes in Management Personnel	56.40%
MUC-7	1998	Air Vehicle Launch Reports	50.79%

Evaluation of precision and recall require the availability of a set of right answers, called the key set, to the information extraction tasks. The normal procedure is to split this right answers set into two: a set to be used in training the system and a set to be used for the actual evaluation. Unfortunately such material for the evaluation of our tasks has not been available. Creation, or annotation, of such key sets would be a valuable research project of its own. This is a major task. Even in MUC-7 the training set was limited to 100 articles and the test set to 100 articles. Annotation also has its own problems. For example, Appelt and Israel (1999) note that usually the interannotator agreement (agreement between two people having annotated the same material for the right answers) has been in the range of 60 to 80 %.

Our general, tentative conclusion about the quality of the IE capability of BRIEFS is that its precision can be presumed good even based on a small training material. Acceptable recall on the other hand may require a large set of training data. What is acceptable precision and recall is case dependent. Relevant results may be achieved if the set of input data is large and precision and recall are not biased toward any special type of feature to be extracted.

8.5.4 Summary of Information Extraction

In this section we have shown results of some experiments we have conducted with the information extraction capability of the BRIEFS System with the primary aim to illustrate what could be done with it. There are technical problems and issues, as we have discussed above. However, the extraction of detailed information and accumulation of it in a database can, with the aid of powerful visualisation, lead to new insights and observation about an industry or some other domain, for which large numbers of news items are found. Important strategic questions may be triggered despite of a not perfect technology. Table 8-11 shows a summary of some sample

scenarios of how extracted information could be exploited in a business context. Some of the scenarios are not highly strategic but the table shows examples of how a single piece of extraction can be of use, where extraction from a series of messages can be of significance and what aggregated extracted information can show.

Table 8-11 Sample summary use scenarios of extracted information

	Single Message	Series of Messages	
Type of Entity	Event	State	Aggregation
Person	Nomination	Current employment, current encumbent	Career, churn in company
Product	Annoucement	Current offerings	Product trends
Company	News about deal	Deal status	Company strategy and success Industry structure
Company	Mention in news	Current tone	Presence in the media
Employment offering	Announcement	Success to fullfil	Company strategy
Technology	News item	Applications reported	Investment trends
Plant	Capacity action	State of plant	Manufacturing capacity & strategy

8.6 Exploiting a Knowledgebase

8.6.1 Description

The accumulation of extracted information in a database can lead to useful insights but there are some issues with the extraction process and the Evidence Database that we have not touched on before. First, there may be duplicate data, e.g. the same event is reported in several news items. Our extraction process is not designed to detect nor prevent this. Secondly, there may be conflicting evidence regarding the same item. Thirdly, although the evidence is stored in a relational database and can therefore be queried extensively, the properties of and the logical connections between the items in the database are not explicitly declared. Thus it is not straightforward, for instance, to pull together all evidence relating to a particular item. For these reasons we designed a knowledgebase into which the accumulated evidence can be imported. We now describe and discuss some initial experimental work we have done in this respect.

The logic of the knowledgebase is governed by a formal ontology as described in Section 7.11. The ontology not only allows defining the concepts, their attributes and

the relations between them. Additionally constraints can be introduced. For instance regarding a person we could say that

- a PERSON can be associated only with one COMPANY at a time
- a PERSON can be associated with several ORGANIZATIONs
- a PERSON is not usually re-employed by a COMPANY (we could define a confidence indicator which is lowered if this happens)

Assuming we wanted to follow up the status and execution mode of the deals between companies we could define allowable transitions from one state to another as is shown in Figure 8-19.

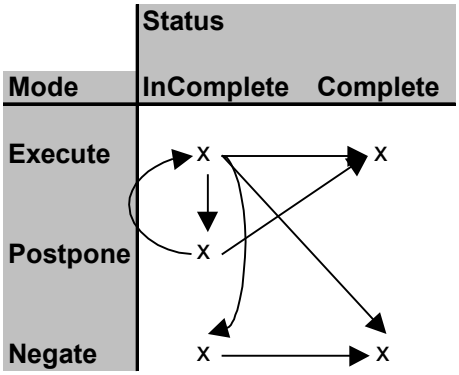


Figure 8-19 Allowable transitions in the status and mode of a deal. Execute means that the deal is being actively pursued.

With the help of the Cone ontology tool all information regarding an entity, for example a company like Nokia, can be pulled together as Figure 8-20 shows. More sophisticated queries and alerts can now be built. The following list contains some queries with which we have experimented

- employment history of a person
- persons that have been re-employed
- persons whose job title has changed
- succession in a position
- a particular company as a participant in a deal
- a new (to knowledgebase) company as a participant of a (particular type of) deal
- a new type of deal for a company
- duplicate deal, different source
- deal structure (strategy) of a company at a point in time

- change in the deal structure (strategic direction) of a company over time
- events in a geographical region
- events in a business group
- structure of a business group
- progress (change of status) of a particular deal

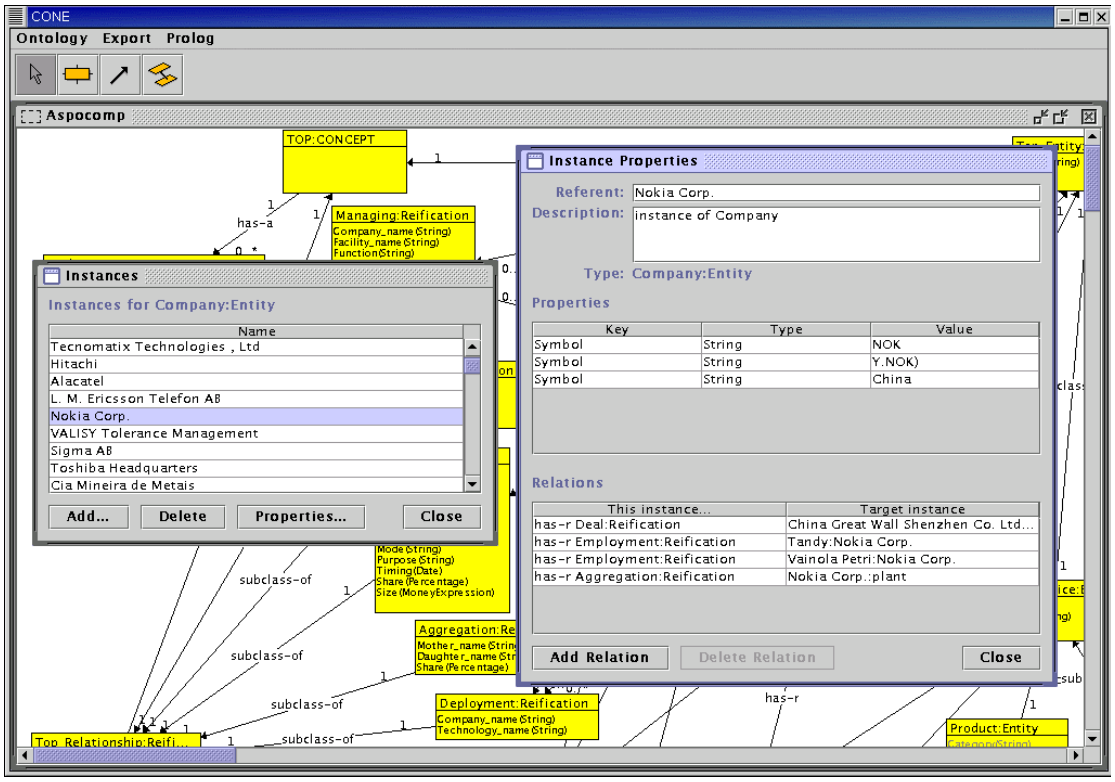


Figure 8-20 Using Cone to pull together information about an entity

8.6.2 Discussion

In this section we have briefly described some early work of converting the evidence accumulated through information extraction into more formally organised knowledge. Several serious issues were identified in this process. Most notably there is the problem of dynamics or change. These occur at many levels. At the simplest level it could concern the name of an entity. For instance the "Phone.com" company was formerly known as "Unwired Planet" and is today called "OpenWave". In the future the company could merge with some other company, or be liquidated. Some of these changes can be observed through information extraction and can be catered for in the knowledgebase. On a more subtle level this change may have also implied changes in strategy. This in turn might signal changes in the industry structure. New concepts

might emerge. In the author's opinion extensive time stamping is required in the knowledge scheme. This involves not just the evidence but also the definitions in the ontology. Another issue is confidence and conflict resolution. Schemes to resolve conflicting evidence and to indicate confidence in the items in the knowledgebase are required.

8.7 Summary

In this chapter we have described and analysed some experiments which we have performed with the BRIEFS System. We have shown what can be done to the benefit of strategy work both with statistical analyses of text and with deterministic information extraction methods. We have shown, e.g. with experiments described in Sections 8.4.2 and 8.5.2, how managers working in the inductive mode could be supported. We have shown some support for managers working in the hypotheses testing mode in Section 8.5.1.

With regard to the BRIEFS System and its capabilities we have gone through a learning process which can be summarised as follows.

1. We started this research recognising that the output of a model (related to business strategy) is dependent on the model itself and its input as described by the following arrangement:

   O = M (I) and **(Equation 8-4)**

   I = T (D) **(Equation 8-5)**

   where **M** is a model of a business

   O is the output of the model

   I is the input to the model

   D is detailed observations about the business and its environment.

   T is some transformation (forming of capta) from detailed observations of the business and its environment to the format and level of abstraction required by the model. This transformation often requires human intervention.

2. We wanted to explore, as described in Sections 6.2 and 6.3 that by computer processing of documents in natural language text format the arrangement described in point 1. above could be changed to

   O = M' (D') **(Equation 8-6)**

   where **M'** is a model derived with the assistance of processing natural language text documents, and

   D' is detailed observations about the business and its environment extracted directly from documents in natural language text format.

   The BRIEFS System was built based on this idea. The experiments we have conducted and described in this section have given some support to the claim that this is a valid approach that can produce plausible results.

3. We have subsequently found, e.g. through the experiments described in Section 8.5 and the tentative considerations discussed in Section 8.6, that through text processing we also can obtain meaningful output in the following arrangement:

   O = V (Σ (D')) **(Equation 8-7)**

   where **Σ** represents the accumulation of detailed observations into an evidence or knowledge base, and

   V represents views into the evidence or knowledge base. These views can be intelligent and complex. In essence the structure of the evidence or knowledge base and the views now form a kind of a model.

We have not yet experimented with all the capabilities of the BRIEFS System. The experiments described here were in the acute interests of the participating companies. They were needed to validate and demonstrate the basic capabilities of the System. More complex experiments are still to be conducted. Most notably we have not explored a consequential logical flow from a Brief to hypotheses and then to the subsequent relevant evaluation, information extraction and knowledge discovery phases. However, we claim that we have shown that a BRIEFS like system can meet

at least some of the requirements posed in Chapter 4. In the light of our experiments we could now summarise how we address the requirements as follows.

1. *Flexibility for accommodating changes in the environment and in the attention of business.* This flexibility is inherent in the architecture of BRIEFS as described in Section 7.2. We have not yet experimented with this aspect.
2. *Flexibility for changing strategic paradigms, to allow for deployment of new concepts in strategy.* BRIEFS System does not subscribe to any particular school of strategy.
3. *Flexibility in bringing a rich and open set of data into a decision making situation.* It is obvious that alternative sets of input text could be processed for alternative results which then could be compared. We have not explicitly experimented with this.
4. *Tolerate masses of irrelevant data and arrive at the best capta, set of relevant data.* The very idea of information extraction in BRIEFS addresses this requirement. Masses of text can tirelessly be processed. In our experiments the data sets typically consisted of some 1000 news items.
5. *Tolerate incomplete and inaccurate data.* Our experiments indicate that meaningful results can be obtained in the BRIEFS System despite of full knowledge of the completeness and accurateness of data. The experiment described in Section 8.5.2 offers some evidence towards this.
6. *Tolerate and be flexible about the uncertainty of future outcomes, allow for the possibility of dynamic multiple futures.* BRIEFS does not directly address this requirement but can be claimed to support meeting it.
7. *Tolerate and be flexible about differences in inquiring organisations.* As such BRIEFS does not subscribe to any particular school of inquiry. The results are non-partisan, consistent. The results are arrived at and processed without tiring regardless of the amount of input data. The interpretation of the results rests with the user, however.
8. *Accumulate timely and comprehensive information and manage dynamic knowledge.* There is indication, though inconclusive, that this may be possible. Much further work is needed, however.

9. *Process and synthesise multiple views in an unbiased way.* BRIEFS processes data in a consistent way. Processing input materials that represent different views can create differing views.

How could we relate the capabilities of BRIEFS to strategy work overall? In Table 8-11 we showed some sample scenarios. A rich set of such scenarios could be defined to support strategy work. Further, these scenarios could be defined with either hypotheses testing or inductive working in mind.

In Section 4.2.1 we explained the 5Ps of strategy defined by Mintzberg (1987a): *Pattern, Plan, Ploy, Position* and *Perspective*. A BRIEFS-like system could serve in all of these contexts. For example

1. Strategy as a *plan*: key concepts and relations thereof in a plan could be identified with statistical and semantic analysis as shown in experiments in Sections 8.3 and 8.4.1.
2. Strategy as *pattern*: using information extraction for tracking and accumulating events related to a company could reveal patterns as was shown in Section 8.5.2.
3. Strategy as a *ploy*: a ploy could be revealed by using information extraction to track events or the presence of issues related to the suspected ploy. The lack of events or their presence or counter change could indicate a ploy. We do not have a specific experiment to report about but point to the discussion in Section 8.4.1.2
4. Strategy as a *position*: using information extraction for tracking and accumulating events related to companies in an industry could be used to highlight and qualify positions of companies in networks of suppliers, competitors and customers. Again, the experiment described in Section 8.5.2 has elements to address this aspect.
5. Strategy as a *perspective*: statistical processing and information extraction could be used to detect the presence of shared key concepts in a company and subsequent changes in its emphasis. The experiment described in Section 8.4.1 could be interpreted in the light of this aspect of strategy.

It is acknowledged that more sophisticated methods could have been implemented in the details of the BRIEFS System. For example more sophisticated statistical methods could have been implemented as e.g. described in Lebart et al (1998) and Manning

and Schutze (1999) or Lebart et al (1998). Iwanska and Shapiro (2000) discuss many aspects of natural language as knowledge presentation and reasoning system. These could be pursued. It is thus acknowledged that further investigation may be needed to further verify and improve the workings of the BRIEFS System and the tentative conclusions arrived at in the individual cases described in this chapter. We claim that the advantages of what we have implemented are that they seem to produce meaningful results, and that they are not overly complicated and thus can be explained to the practising managers.

We have yet to find out what managers do think about the BRIEFS System. This is addressed in the following chapter.

9 Management Feedback

Support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.

1. **What kind of computer based tools exist to support strategy work?**
2. **Are the tools used?**
3. **Is there a need for the tools?**
4. **What are the requirements for the tools?**
5. What could be the solutions for the tools?
6. Could partial and useful solutions be built?
7. **What does management think about the partial solutions built and why?**

9.1 Introduction

In this chapter we primarily intend to provide answers to the first part of our research question number seven: "what does management think about the partial solutions built?". The aim is to further validate and evaluate the plausibility of the basic ideas of the BRIEFS System and the applicability of its potential results in strategy work. We also want to obtain more answers to our first four research questions about the existence, the use, the need and the requirements for tools to support strategy work.

This chapter describes the methodology, the design and the conduct of the interviews, and presents the analysis and results of the interviews and the conclusions.

9.2 Methodology

In management systems it is hard to create stable, repeatable and equitable testing and validating situations. The dynamic world makes fair comparison and validation of cases problematic. It is hard, maybe even impossible, to conduct blind tests as is commonplace e.g. in the pharmaceutical industry.

The constructive approach offers the concept of market-based validation. Strong or semi-strong market test requires adoption of the construction by companies. Weak market test involves finding any managers willing to apply the construction in his or her actual decision-making (Kasanen et al (1993)).

Due to the complexity of our system and its experimental nature it has not been practicable to give our system to managers to install and try out. We have therefore

resorted to a version of the weak market test. We have asked a set of managers about their willingness to apply by interviewing them.

In the interviews we resorted to a semi-structured scheme, sometimes also called *thematic interview* (Hirsjärvi and Hurme (1980)). We designed a pre-defined sequence of questions or discussion themes but did not attempt to offer any pre-set responses for selection by the interviewees. We expected that in this way the results of the interviews would be comparable but at the same time a rich set of answers would be gained. As Fontana and Frey (1994) note, structuring is needed to explain behaviour within pre-established categories (e.g. in relation to aspects of BRIEFS) but the unstructured approach serves to understand complex behaviour of members of society without imposing any a priori categorisation that may limit the field of inquiry.

In the analysis of the results for validation we followed an inductive-deductive technique (for some issues see e.g. Bloor (1978)). We first found out the willingness of a manager to adopt our system and then analysed what characteristics explained their attitude. We claim that sophisticated statistical methods are not warranted here for two reasons. The first is that the sample is small. The second is that statistical devices such as average, deviation and the like mean little here. The scales of the classifications of interview data are primarily categorical or at most ordinal. Everything counts and all opinions are correct. It is necessary to study and understand the details. Nevertheless, for completeness, we resort to the non-parametric χ^2 statistic to test for homogeneity or independence in the contingency tables resulting from our analyses (Järvenpää & Kosonen (1997)). The results of these tests should be treated with caution.

9.3 Design and Execution of the Interviews

9.3.1 Selection of Managers

It was deemed that special expertise was required from the managers to be interviewed. The managers were to have been involved in a strategy process either as a decision-maker or in a supporting role. The managers were to represent companies that are considered to be on the leading edge and operate in competitive and dynamic

industries. This selection was intended to ensure that a common language and framework would be shared between the interviewer and the interviewees. Additionally, it could be expected that these managers would understand the topic of the interview and grasp the ideas and intents of BRIEFS. A statistical sample would not have made sense.

To create a balanced sample of managers they were selected from three categories:

1. Members of the BPTT and BRIEFS projects' former and current Steering Committees who have provided some funding for the projects. (8 managers)
2. Other managers the author has approached with the BRIEFS project for funding or for some other reasons. (12 managers)
3. Other informed managers not familiar with the project. Some of these were from the investment community as was suggested by some managers in the first two categories. (6 managers)

Altogether 26 managers were thus selected and interviewed. The list of managers is in Appendix 2. None of the managers interviewed could be said to have had vested interests, commercial or intellectual, to protect with regard to the BRIEFS System. The characteristics of the group of interviewees are described in detail in Section 9.4.

9.3.2 The Interview Process

It was expected that the interview must be conducted in a maximum of two hours. It was felt this was the maximum a busy manager could allocate. In practise this turned out to be a good constraint. The managers were willing and able to afford the time and the interviews could be completed within the time. Only in a couple of occasions the manager seemed pressed for time.

No prerequisite material was given to the interviewees before the interviews. It was felt that some would review the material thoroughly and some less so. By not sending anything in advance it was thought that the level of pre-knowledge of the people was under better control.

The interview was conducted by presenting sequentially a set of discussion topics (to be called themes in the following) to the interviewee. There was a PowerPoint slide

per theme. The slides were in English but the interviews were conducted in Finnish. An introduction to each theme was given. The introductions were in general short and neutral but they were tailored somewhat depending on the interviewee's background and familiarity with the project. The managers were allowed to freely reflect and comment on the themes. They were not restricted in their answers to just their current operative environment. Rather, they were allowed to base their answers in all their personal experience and observations of other managers as well. It was thought that a wider scope of business and management wisdom would be captured this way.

As could be expected some managers were more verbose than others, some better at expressing their thoughts than others, and some more imaginative than others.

The interviews were planned to progress as follows:

Introduction part

1. State purpose of interview:
   "to survey management's views about the prospects of modern IT to support activities related to strategic business planning".
2. Explain structure of the interview: Part A is for background information and understanding. Part B is for specific feedback on the BRIEFS System..
3. If not already known, ask interviewee to explain his job.

Part A, Background Information

4. To chart managers basic attitudes about their job, decision making, and information present the Mintzberg themes for discussion (one slide at a time). Additionally present some themes devised by the author (the Keijola themes) and invite comments. For the details of the themes see Section 9.3.3 in the following.
5. Ask also about preferences for the ways and means of presentation and for the sources of information.

Part B, Specific Feedback on BRIEFS

6. Explain the BRIEFS refinement pipeline and "making sense" ideas. Discuss these.
7. Show some sample scenarios. Discuss these.
8. Show selected BRIEFS result screen shots and invite comments.
9. Summarise

In all the interviews this scheme was systematically followed. Only some minor wordings were changed in the presentation slides as a result of the first three interviews.

The following facts all helped control the interview process and keep it in focus:

1. the interviewees did not have advance copies of the slides and did not get paper copies during the interview
2. only one theme at a time was visible to them during the interview and
3. on most occasions a large screen in a comfortable conference room was available,

The interviews were recorded. The recording failed in three interviews for various operative reasons. However, as meticulous notes were also taken and as the summaries were produced soon after the interview, this was considered not to have impacted the quality of the result of the interview. Thus also these interviews are included in the results. No notes or summaries of the interviews were sent back to the interviewees. It was felt that their spontaneous answers were to be preferred because the circumstances in which they were given were better understood.

The detailed themes and the pictures presented in the interviews are described in the next section.

9.3.3 The Interview Themes and Pictures

9.3.3.1 The Mintzberg Themes

Mintzberg (1996) states and presents evidence about some folklore and some facts about managerial work. These were chosen to be the "starters" for the interview sessions because of their crisp and perhaps even controversial nature. It was thought that they get the "circulation" of the interviewees going and set the tone for a serious working session. At the same time they were considered to provide more answers to the first four research questions. The themes presented were

1. *Folklore*: The manager is a reflective, systematic planner. *Fact*: Study after study has shown that managers work at an unrelenting pace, that their activities are

characterised by brevity, variety, and discontinuity, and that they are strongly oriented to action and dislike reflective activities.

2. *Folklore*: The effective manager has no regular duties to perform. *Fact*: In addition to handling exceptions, managerial work involves performing a number of regular duties, including ritual and ceremony, negotiations, and processing of soft information that links the organisation with its environment.
3. *Folklore*: The senior manager needs aggregated information which formal management information system best provides. *Fact*: Managers strongly favour the verbal media - namely, telephone calls and meetings.
4. *Folklore*: Management is, or at least is quickly becoming, a science and a profession. *Fact*: The managers' programs - to schedule time, process information, make decisions, and so on - remain locked deep inside their brains.

9.3.3.2 The Keijola Themes

The author devised some additional themes to bring the discussion closer to the actual topic of information processing for strategy. It was expected that answers to especially the third research question "is there a need for the tools?" would be gained. These themes only had the "folklore" (the hypothesis) part.

1. *Folklore:* Companies are flooded with (strategic) information. They wish they could analyse it better.
2. *Folklore:* Companies actively pursue new computer based tools to improve their strategy processes.
3. *Folklore:* The most important strategic information is not available electronically or on paper.
4. *Folklore:* The emergence of the Semantic Web is a promising development also from the corporate planning (non-operative) point of view

9.3.3.3 Preferences for Presentation and the Sources of Information

Different means of presentation were listed on a slide to get the interviewees' preferences about the way they want to see material related to decision making presented to them (Figure 9-1). The interviewees were asked to prioritise these.

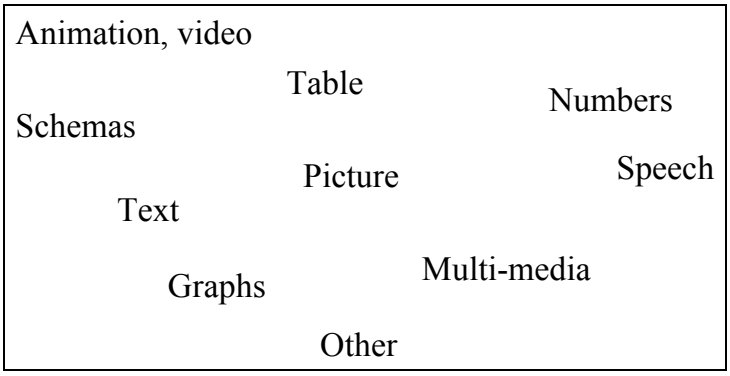


Figure 9-1 Different means of presentation

Finally, in Part A, we asked about the interviewee's about their preferences for the sources of information for strategic decision making. No "laundry list" was offered.

9.3.3.4 The BRIEFS Text Refinement Pipeline

Part B started with a presentation and discussion of the BRIEFS text refinement process as re-depicted in an iconised form in Figure 9-2.

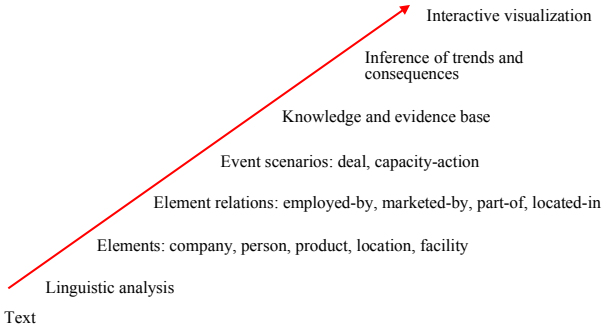


Figure 9-2 The BRIEFS text refinement process

9.3.3.5 Examples of Types of Information Extraction and Potential Uses

To give especially the uninitiated interviewee some idea about possible uses of the extracted information the scenarios shown in Table 9-1 were presented. The scenarios were then discussed.

Table 9-1 Sample usage scenarios for extracted information

Type of Entity	Single Message Event	Series of Messages State	Aggregation
Person	Nomination	Current employment, current encumbent	Career, churn in company
Product	Annoucement	Current offerings	Product trends
Company	News about deal	Deal status	Company strategy and success Industry structure
Company	Mention in news	Current tone	Presence in the media
Employment offering	Announcement	Success to fullfil	Company strategy
Technology	News item	Applications reported	Investment trends
Plant	Capacity action	State of plant	Manufacturing capacity & strategy

9.3.3.6 Selected BRIEFS Information Extraction Based Screenshots

Some selected BRIEFS screenshots were introduced and feedback was solicited (Figure 9-3 to Figure 9-6). They are here shown in iconised form as they have already been discussed in Chapters 7 and 8.

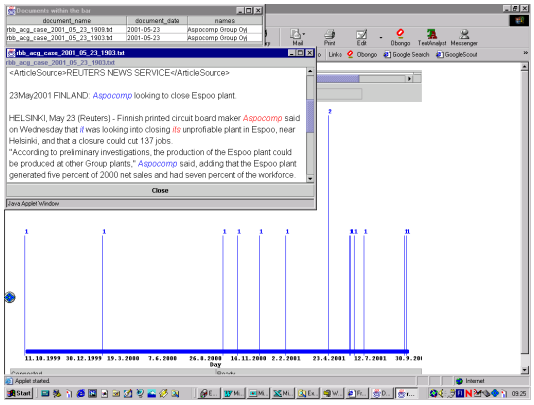


Figure 9-3 Understanding presence, trends; persons, products, technologies

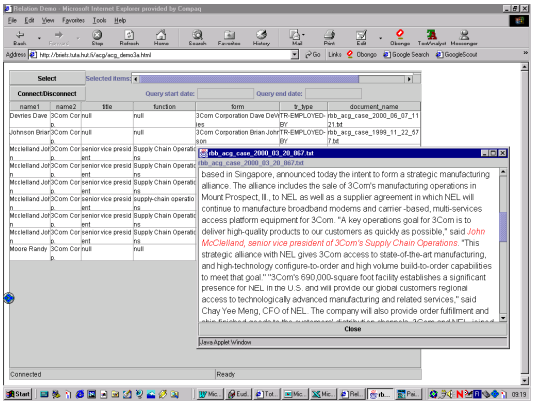


Figure 9-4 Revealing relations; e.g. company spokesmen, change of jobs

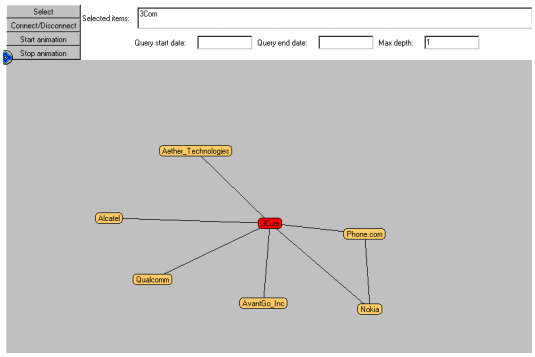


Figure 9-5 Following up the deals of a single company, e.g. changes in types of deals reported

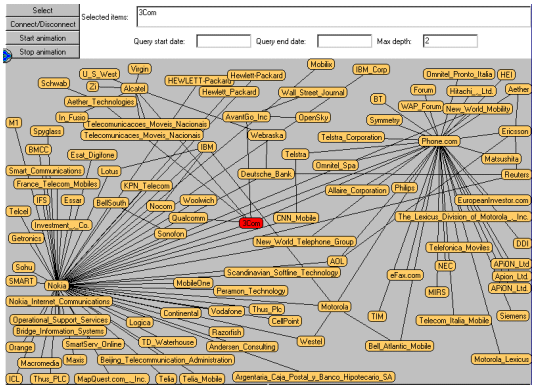


Figure 9-6 Accumulation of deals to reveal industry structure

9.3.3.7 The Knowledge Base and Examples of Complex Queries

The knowledge base makes possible many complex queries not possible with traditional retrieval systems and search engines. The following examples were shown and comments were invited.

- A particular company as a participant in a deal
- A new (to knowledge base) company as a participant of a (particular type of) deal
- A new type of deal for a company
- Deal structure (strategy) of a company at a point in time
- Progress (change of status) of a particular deal
- Change in the deal structure (strategic direction) of a company over time
- Events in a geographical region
- Structure of a business group
- Events in a business group

9.3.3.8 Allied Riser and Industry Clustering

The idea of statistical text processing was introduced. Two screenshots were shown about the results in the BRIEFS System and comments were invited.

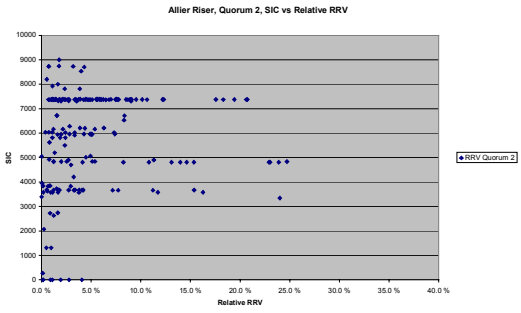


Figure 9-7 Allied Riser: Revealing similarity of interests

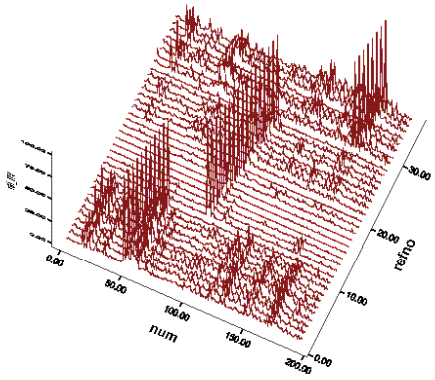


Figure 9-8 Industry clustering

9.3.3.9 Summary

To summarise the discussion on the BRIEFS System the following questions were presented:

- Would you implement (the system)?
- Conditions for implementation?
- How would you use?
- Would it make your work different?
- In what way?

9.4 Analysis of Interview Data

The interviews were summarised by the author into a large spreadsheet by person (columns) and by theme (rows). Although the interviews were conducted in Finnish the summaries were produced in English. The interview tapes were not transliterated in detail.

Some background information about the persons interviewed and about the companies they represented was added to the table by the author. These included e.g. person's age, management experience, and familiarity with the BRIEFS project as well as the industry, geographic scope of operations and the size of the company

The spreadsheet was the working base for the subsequent analyses to be presented in the following. We first analyse the background of the group of interviewees in order to establish its representativeness. In the subsequent analyses we are primarily interested in validating our basic assumptions and the concepts of the BRIEFS System. We start by considering each theme on its own. The themes are then combined for a higher level of abstraction and summary.

9.5 Analysis of the Background of the Interviewees

9.5.1 Analysis

The 26 interviewees represented 19 different companies. Of these 7 were small (less than 100 people), 6 were medium sized (less than 1000 people) and 6 large. It should be noted that many interviewees actually have experience of companies in several size classes. In particular six interviewees now representing small companies also have experience about large corporations. Of the companies the interviewees represented, 9 could be said to operate mainly domestically (although it might be part of an international corporation) and 10 internationally or globally. The distribution of the companies and the interviewees in the companies is summarised in Table 9-2.

Table 9-2 The distribution of the companies and the interviewees within the companies by the size of the company and by the internationality of the company's operations (no of companies / no of interviewees). $p(\chi^2) = 0.008$ for companies and = 0.000 for interviewees

Company size	Internationality		
	Domestic	International or global	**Total**
Small	6/6	1/1	**7/7**
Medium	3/3	3/3	**6/6**
Large	0/0	6/13	**6/13**
Total	**9/9**	**10/17**	**19/26**

There is a lack of large companies with only domestic operations. This lack is justified by the fact that such companies are rare in Finland. There is also a bias for people from large companies. This is to be expected and even desired. We consider BRIEFS is predominantly for the larger companies.

The companies represented 13 different industries and the interviewees had 17 different job titles. The viewpoint of the interviewees towards the BRIEFS System varied. The majority (18) could be said to have considered it for internal use. Additionally some were considering it either from a commercialisation of service or a financing point of view.

Of the interviewees 10 were considered junior by age (35 years or younger), 10 mature (over 35 and under 55) and 6 senior (55 or over). The distribution of the interviewees is further classified by the size of company as shown in Table 9-3

Table 9-3 The distribution of the interviewees by the age group and the size of companies. $p(\chi^2) = 0.956$.

Age	Company size			
	Small	Medium	Large	**Total**
Junior	3	2	5	**10**
Mature	3	2	5	**10**
Senior	1	2	3	**6**
Total	**7**	**6**	**13**	**26**

The distribution of the interviewees into age groups and size of company groups is thus quite even.

About half of the interviewees could be considered to have had experience at the top management level in their companies as Table 9-4 shows. Top management here includes Chairmen of the Board, CEOs and members of the Executive Team.

Table 9-4 The distribution of the interviewees according to their age group and their top management experience. $p(\chi^2) = 0.007$.

Age	**Top management experience**		
	No experience	Has experience	**Total**
Junior	8	2	**10**
Mature	4	6	**10**
Senior	0	6	**6**
Total	**12**	**14**	**26**

Again the distribution is not quite balanced. This can only be expected. The more senior people have more experience but on the other hand all age groups do include decision-making experience.

The distribution of the top management experience of the interviewees by the size of the company is shown in Table 9-5.

Table 9-5 The top management experience of the interviewees by the size group of the represented companies. $p(\chi^2) = 0.126$.

Company size	**Top management experience**		
	No experience	Has experience	**Total**
Small	1	6	**7**
Medium	3	3	**6**
Large	8	5	**13**
Total	**12**	**16**	**26**

Decision making experience at the top is represented in all company size categories.

The "*outgoingness*" of a person is a somewhat subjective judgement by the author to indicate a basic personality feature. It was considered to study how personality might affect a person's position and attitudes. A person was judged "*extrovert"* or "*introvert"* if he clearly, in the author's opinion, belonged to that class, if there was doubt he was classified as *neutral*. It is acknowledged that this classification of the interviewees has not been executed through psychological tests and does not meet the standards of a psychologist. Nevertheless our classification helps in explaining the results. The

distribution of the interviewees into the classes of "extrovert"/"introvert"/"neutral" and by the size of the company is shown in Table 9-6.

Table 9-6 The distribution of the interviewees by their "outgoingness" and company size group. $p(\chi^2) = 0.419$

Company size	**"Outgoingness"**			
	"Extrovert"	"Neutral"	"Introvert"	**Total**
Small	5	1	1	**7**
Medium	4	1	1	**6**
Large	4	4	5	**13**
Total	**13**	**6**	**7**	**26**

"Introvert" and "neutral" interviewees are prominently present in the large companies. One could argue that there is more need for planning in these companies and that the introvert and neutral people may be more appropriate for these tasks. We computed the probability of the χ^2 statistic for this two by two regrouping as 0.050. The result is thus almost significant. Further study would be needed if one wanted to pursue this argument.

"Introvert" and "neutral" interviewees are also more prominently present in the youngest age class as shown in Table 9-7. The χ^2 statistic does not fully support this statement, however.

Table 9-7 The distribution of the interviewees by their "outgoingness" and their age group. $p(\chi^2) = 0.088$

Age	**"Outgoingness"**			
	"Extrovert"	"Neutral"	"Introvert"	**Total**
Junior	2	3	5	**10**
Mature	8	1	1	**10**
Senior	3	2	1	**6**
Total	**13**	**6**	**7**	**26**

The interviewees were further classified according to their role in the strategy process. A person was classified as "*decides*" if he was considered to clearly be at least partially responsible of some strategic decisions. A person was classified as "*supports*" if he was seen to have good visibility to strategy work. He could assist some strategic decision-maker or support or manage the strategy process. The jobs of about 40% of the interviewees were directly linked to supporting strategic planning and decision making and about half could be considered decision makers. Two

interviewees did not have current involvement in strategy work. The distribution of the interviewees by their role in strategy work and their "outgoingness" is shown in Table 9-8

Table 9-8 The distribution of the interviewees by their current role in the strategy process and by their "outgoingness". $p(\chi^2) = 0.310$

Role in stategy process	**"Outgoingness"**			
	"Extrovert"	"Neutral"	"Introvert"	**Total**
Decides	8	4	1	**13**
Supports	4	2	5	**11**
No current role	1		1	**2**
Total	**13**	**6**	**7**	**26**

One could argue that a lesser proportion of the extroverts seem to be in the supporting role but the major part of the introverts is in that role. The probability of the χ^2 statistic is 0.310. Thus the statement is not supported by statistical significance. The set is balanced in this respect. However, if we group the "introverts" and the "neutrals" together then the probability of the χ^2 statistic is 0.005, on the border of almost significant. Further study would still be needed in one wants to pursue the argument.

Regarding the education of the interviewees all of them have university degrees, mainly in business administration or engineering. Eight have earned a PhD.

The interviewees varied in their familiarity with the BRIEFS System at the time of the interview. The familiarity of the person was assigned to one of four categories. It was considered *high* if he had been a member of the latest BRIEFS Steering Committee, *medium* if he had been a BRIEFS Steering Committee member at an earlier stage of the project, *low* if he had been a BPTT Steering Group member or had been given presentations about the BRIEFS System and *none* if he had never had any exposure to the system.

The technical competence to understand the technical aspects of the system also varied. A competence level, based on the author's somewhat subjective judgement, was assigned to the interviewees. The judgement was based on the interviewee's training and job history. The level of competence was considered *high* if the person

could be considered to generally well understand the practical and technical limitations imposed by the technology deployed in the system, *medium* if the person was considered to have some understanding of these limitations in their work environment, and *low* if if the person was considered not to be able to judge the technological state of the system.

By combining the pre-familiarity and technical competence the distribution presented in Table 9-9 is attained.

Table 9-9 Distribution by pre-familiarity and technical competence. $p(\chi^2) = 0.006$.

Pre-familiarity	**Technical competence**			
	High	Medium	Low	**Total**
High	1	3		**4**
Medium	1	3		**4**
Low	4	5	3	**12**
None	1	1	4	**6**
Total	**7**	**12**	**7**	**26**

The χ^2 statistic seems to indicate dependence between the variables. People with no pre-familiarity seem to have lower technical competence vs. the rest. After appropriate regrouping it is supported by the probability of the χ^2 statistic of 0.042. Does this impact our study? We do not think so. It is natural that the technical competence of some of the managers has become higher during prolonged relation with the BRIEFS project. This could explain the voids in the low technical competence category for the more familiar interviewees.

9.5.2 Summary

Admittedly our sample of managers is small. However, based on the analysis of the background of the interviewees the interviewed group represents a balanced set of distribution of the background variables. The calculations of the probability of the χ^2 statistic also tend to support this statement. We did note some potential dependencies between the background variables. As further studies would be needed to confirm the nature and strength of these dependencies we have ignored them in the following analyses. Management environments, managerial types, technical competence, and familiarity with the project are varied and well represented. Informed and rich

feedback of perceptions based on varying viewpoints and background is to be expected.

9.6 Analysis of the Interviews by Theme

This analysis is qualitative. Its purpose is to reflect the overall feelings and opinions of the interviewees towards the themes presented. It strives to show the richness in the details of thinking among the interviewees. We watch for answers to our research questions, and for collective themes that emerge from the interviews; themes that should be paid attention to in the design of systems for strategy work.

There have been no preconceived classification or taxonomy for analysing the responses. We have let the "data talk" and thus follow an inductive procedure.

We first analyse the responses to the background themes one at the time and then proceed to analyse the BRIEFS related themes.

The quotations to be presented in the following have not been translated from Finnish into English ad verbatim; they have been somewhat subjectively abridged and abbreviated by the author as deemed, in the author's judgement, appropriate for capturing the essential in our context and without distorting or losing information. To alleviate bias resulting from this would have meant the presence of at least another knowledgeable pair or eyes and ears in the interviews. Unfortunately this was not feasible.

Numerous quotations will be presented to give the reader a full flavour of the richness of the feed-back. An alternative would have been to give a short summary here and a full-blown report in an appendix. We decided, however, that the alternative chosen here is simpler. The reader, should be so inclined, can skim over the details of the responses. To assist in this the feed-back is presented in a distinguishing font.

To protect the anonymity of the interviewees in the following they are identified by codenames only. The codename is of type Mnn, where nn is a unique internal number assigned to the interviewee by the author. The number does not signify anything. It is

not related to anything else than the identification of the individual interviewee by the author.

For many themes a simple and somewhat subjective evaluation code of the interviewees' overall attitude towards the particular theme has been assigned. There are two types of coding, one for the background themes and one for the BRIEFS related themes.

The attitude coding for the background themes is:

- A = Agrees if the response is clearly in agreement with the theme
- R = Reserved if the response clearly shows reservations or the response is not in clear agreement or disagreement with the theme
- D = Disagrees if the response is clearly in disagreement with the theme

The attitude coding for the BRIEFS related themes is:

- P = Positive, if the response is overwhelmingly positive towards the theme,
- D = Doubtful if the response reflects some doubts about the practical value and is not overwhelmingly positive or negative. Doubtful was also assigned if the person offered no views.
- N = Negative if the response is overwhelmingly negative.

The scores to these categories per theme are shown at the beginning of each discussion in the following.

9.6.1 The Background Themes

9.6.1.1 Mintzberg 1

Folklore: The manager is a reflective, systematic planner.
Fact: Study after study has shown that managers work at an unrelenting pace, that their activities are characterised by brevity, variety, and discontinuity, and that they are strongly oriented to action and dislike reflective activities.

Folklore: A = 7, R = 12, D = 7
Fact: A = 23, R = 3

(A = Agrees, R = Reserved, D = Doubtful)

The responses about the folklore statement were for the most part reserved or disagreeing. They ranged from

"There is lots of reflection in my company." (M23) to

"Maybe in civil service but not in business." (M6).

There was no interviewee who disagreed with the fact part. Typical comments are:

"Managers live in a world where forecasting is difficult. Fires are extinguished in the order of ignition not in order of magnitude. Some industries are more forecastable than others are. Process based industries are easier, project based are characterised by discontinuance." (M10) and

"Not too much said. Some people even succeed" (M7).

There was, however, an almost unanimous view that more reflection was necessary:

"Cannot always be reacting must have a proactive attitude." (M21).

Many stated that both action and reflection are needed. These do not necessarily reside in the same person. One practical solution suggested was that the action-oriented manager has reflective capacity close to him:

"Ideal is that the manager himself is a man of action but values that he has brain power at his disposal that also forces him into thinking." (M5).

The important role of intuition was brought up in many interviews.

"Without proper vision or strategy nothing is possible. But in practise there is shortage of time and discontinuation leading to improvisation. New innovative solutions have to be devised." (M22).

In summary, the managers agreed that the environment affects their work and is not conducive to reflective activities but at the same time they acknowledge the importance of reflection.

9.6.1.2 Mintzberg 2

Folklore: The effective manager has no regular duties to perform.
Fact: In addition to handling exceptions, managerial work involves performing a number of regular duties, including ritual and ceremony, negotiations, and processing of soft information that links the organisation with its environment.

Folklore: A = 0, R = 0, D = 26
Fact: A = 26, R = 0, D = 0

(A = Agrees, R = Reserved, D = Doubtful)

There was a strong agreement about this theme among the interviewees. They disagreed with the folklore and agreed with the fact. In addition many emphasised the virtues of regularity

"Regularity is also a virtue. Rituals ensure communication." (M18),

" Regular tasks support decision making. 60% is routine that is not fun but it enables the 40% that is fun. Routines are processes for effective management." (M3).

"There are regular duties galore. Systematic rhythm is necessary. It is the clock of the company." (M14).

Also the necessity of processing soft information was mentioned:

"Linking to environment absolutely necessary. Intuition is no longer sufficient. Much more understanding is needed." (M17),

"A connection to everything is needed." (M26).

9.6.1.3 Mintzberg 3

Folklore: The senior manager needs aggregated information which formal management information system best provides.
Fact: Managers strongly favour the verbal media - namely, telephone calls and meetings.

Folklore: A = 16, R = 9, D = 2
Fact: A = 20, R = 6, D = 0

(A = Agrees, R = Reserved, D = Doubtful)

Many interviewees agree in general with the folklore:

"Aggregated information is needed for sufficient awareness. Regular information gives background." (M9).

However, they state serious reservations:

"MIS gives only partial information. Other aggregations are needed too." (M22),

"Official information is coloured in a certain way. The corporate official view reinforces itself. If this is the only source you are in trouble." (M16),

"In crisis e.g. you need to have a good data collection system." (M6),

"Trouble with aggregation is that you cannot question its base. A manager must understand how aggregation has been done." (M5).

The group acknowledges the importance of the verbal media:

"Verbal media is obligatory. Need to have open channels and processing in order stay in focus. Taking care of relations and networks is important." (M22),

"This is how profound information is communicated." (M23),

"Information is complemented with verbal. The more uncertainty the more verbal." (M21),

"This is necessary for weak signals." (M26),

"Information not exclusive, must be verified, many channels needed." (M13),

"Some want to look in the eye-balls." (M7).

Serious reservations with regard to verbal communication are also expressed, nevertheless:

"Communication is easy but inexact." (M23),

"… but this information is coloured by people's personal characteristics and ambitions." (M6),

"These are valuable, too, but do not give systematic background." (M9),

"Some verbal not useful, e.g. listening to analysts." (M1).

To summarise, whilst MIS is seen as necessary it is not sufficient. In particular it seems to suffer from the perspectives of coverage, credibility and understandability. For these reasons verbal communication is necessary. The issues, whilst alleviated, do not seem to completely disappear even then, however.

9.6.1.4 Mintzberg 4

Folklore: Management is, or at least is quickly becoming, a science and a profession.
Fact: The managers' programs - to schedule time, process information, make decisions, and so on - remain locked deep inside their brains.

Folklore: A = 6, R = 9, D = 11 (This scoring is regarding the "science" part)
Fact: A = 14, R = 12, D = 0

(A = Agrees, R = Reserved, D = Doubtful)

Regarding the folklore part there was a general agreement that management is a profession. Some noted that there is even specialisation within this profession:

"Has always been a profession." (M24),

"Managing is a skill of its own. This is the direction." (M20),

"Professions among profession (turn-around, down-sizing, …)." (M25)

The views about management becoming a science were mixed. Some were downright negative:

"No signs." (M7),

"Science does not have a model for every situation in real life." (M6), "Intellectual business game cannot be modelled." (M16),

"There exist good practises. There are certain laws that govern people, finance etc. Science, however, is not possible." (M4).

Some other views were more positive:

"It is possible to analyse managers' work. There are lots that can be modelled. Not all, however. One should strive for this and create supporting systems so as to free time for more undefined matters. It is no use excuse to say that because it is too difficult we should not strive for this. One must try." (M21),

"Strong direction in companies towards systems dynamics thinking. Quality thinking in management processes. Companies are designing planning processes, e.g. based on BSC (Balanced Scorecard)." (M19).

Regarding the fact part there was general agreement. Several stressed again the importance of intuition:

"Intuitive decisions, sometimes. Successful decisions are sometimes even pure luck. Not everything is the result of cold reflection." (M6),

"Room for intuition. Experience builds ability to practise intuition." (M5).

Some others brought up the fact that change in management's programming is difficult:

"Yes, man becomes conditioned." (M9),

"Habits once acquired are hard to change." (M1).

9.6.1.5 Keijola 1

Folklore: Companies are flooded with (strategic) information. They wish they could analyse it better.

Folklore: A = 24, R = 2, D = 0

(A = Agrees, R = Reserved, D = Doubtful)

There was universal agreement about the quantitative aspect of this theme. Some were a little pessimistic about the wish to analyse:

"They do not. They just wish there would not be so much information. They may hope they could understand it better." (M7),

"Yes, but company just does not like to be flooded (quantity is the problem, quality issues have not been raised). They do not wish to analyse it better." (M8),

"Information exists. Partly people wish for better analysis but the illusion that better answers can be found has faded." (M4)

The need for analysis, or rather the use "to better utilise, to apply for better decisions and in the implementation of decisions" as one interviewee (M15) refined it, was brought up in many ways:

"There is no flooding of relevant information." (M10),

"Information needs significant filtering and deciphering. Not much is left unknown. The question is to detect from flood." (M9),

"Problem is how to detect relevant information in current context. What is the message of information? Detection of dependencies?." (M24),

"Most of the flood is not strategic information. Strategic gets drowned, as it is not easily detected. Sometimes synthesis is needed to understand where the world is going." (M21),

"This is what everybody wishes. And to combine with existing information. There is so much information. It is necessary to understand the nature and content of data. Information does not necessarily increase but multiplies. We do not get flooded with competitive or market information. Much useless information exists but not too much relevant information." (M17)

9.6.1.6 Keijola 2

Folklore: Companies actively pursue new computer based tools to improve their strategy processes.

Folklore: A = 7, R = 3, D = 16

(A = Agrees, R = Reserved, D = Doubtful)

Two of the interviewees felt they did not know enough to express an opinion. These were classified as "reserved". The majority did not agree with the folklore statement:

"Strongly stated. True only for Datawarehousing." (M1),

"Not so. Excel is still the best." (M15),

"People too often think knowledge is rational. Not so. Strategy process is combined analysis and tacit interpretation." (M13),

"People do this because everybody else does. Strategy process is very amoebic and needs to be very flexible." (M14).

Some felt that there is more work going on at Business Unit level rather than at the corporate level:

"Corporation - less, BU's more." (M11),

"Not much used in mother company because process is based on interaction in meetings and seminars. Maybe BUs consider e.g. BSC (Balanced Scorecard)." (M20).

There seemed to be belief in the possibilities of IT to improve the efficiency of the strategy process or at least in some parts of it:

"Some with bad conscience may buy. Most do not fall in this trap. It may be possible to improve the efficiency of the process but not its quality." (M7),

"We use tools for implementation and communication. PowerPoint is used for frames and models." (M4)

In summary there did not seem to be much belief in the use and utility of even new computer based tools in the strategy process especially at the group level.

9.6.1.7 Keijola 3

`Folklore: The most important strategic information is not available electronically or on paper.`

Folklore: A = 13, R = 10, D = 3

(A = Agrees, R = Reserved, D = Doubtful)

Half of the interviewees (13) agreed with the folklore statement.

"That's the way it usually is." (M23),

"Subscribe to this. The most important information is not yet documented." (M20),

"True. Can be and have tried to document but tacit knowledge or embedded thinking hard to. It cannot mean that we do not try. All input is not documented either. An electric system is too narrow band. Strategy cannot be separated from people. Plan cannot be separated from execution." (M14),

"This is the way it is, especially in the small to medium business world. Most is between ears. Big leaps especially pondered long before being documented." (M10).

There were many more qualified answers, however:

"Not true. Little time to talk to people. Facts must be found on paper." (M1),

"Yes and no. All strategic information is not on paper. E.g. company and industry re-organisations are at least not initially on paper. On the other hand product and marketing information can be connected because exist electronically." (M24),

"This is true. Should be in the brains of salesmen, management, planners, customers, etc. Lots of essential macro-information exists, though." (M5),

"Yes and no. Enormous amounts of electronic information exist. This is not possible for humans to process. Searching necessary to automate. Decision- making and finding cause-effect relations is for humans to make. Internet is the best example of vastness of information." (M6).

9.6.1.8 Keijola 4

Folklore: The emergence of the Semantic Web is a promising development also from the corporate planning (non-operative) point of view.

Folklore: A = 8, R = 14, D = 4

(A = Agrees, R = Reserved, D = Doubtful)

Almost half of the interviewees did not know what the idea of the Semantic Web (SW) promoted by the World Wide Web Consortium is. A brief introduction was then given.

There was a reserved optimism but some serious questions among the interviewees:

"Probably. I am not an expert. Could be but not necessarily. Timetable longer than most believe." (M22),

"Does not dare to say anything. Would not like to condemn." (M7),

"The idea is good from the point of input streams. Do we filter too much? SW might mechanise too much." (M14).

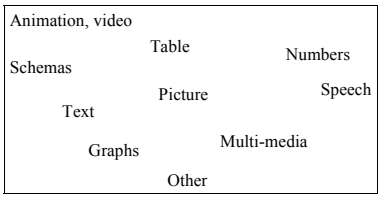
An elaborate answer, from an informed person, was

"Possibly. What will be genuine, right applications of the SW remains to be seen. Lots of promises. We do not know how to refine information. Intelligent layers on top of information layers need to be built. The issues are

1) Creation of metadata: cost: need for human resources for high quality information, half-automation sacrifices quality, what are developments here, commercial benefits?

2) World model: management of concept schemes, annotation vs. concept schemes, linking of these pre- or post-." (M26)

9.6.1.9 Preferences of presentation



Many of the interviewees stated that the preferences of presentation vary between persons and are very personal. In this group only three out of the 26 interviewees put text as their preferred means of presentation whereas 17 put some sort of graphical presentation (schemas, graphs, or pictures) well ahead of text. Additionally half (13)

preferred numerical presentation (numbers, tables) over text. Many preferred packages where graphically oriented presentation is complemented by speech:

"A visual document introduced by somebody." (M14).

This, they felt, increased bandwidth and allowed for interaction.

Text thus does not seem to be the favoured means of presentation for this group of managers.

9.6.1.10 Preferred Sources of Information

The preferred sources of information varied a lot as could be expected because no "laundry list" was presented. Some wanted to qualify their answers by the type of information that was needed for the type of decision-making situation. One comprehensive answer that describes the multitude of information sources is:

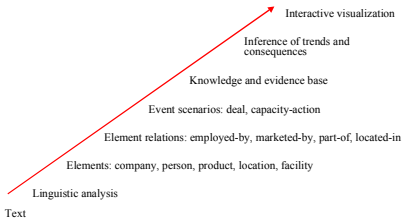
"Depends on decision situation, e.g. exit vs. new business vs. expansion. Customers (including annual reports and brochures), research institutions (e.g. product development), competitors (and information they give out), industrial organisations and events of trade, colleagues in other companies, internal network, own social network, catching of random information (bars, airports, ...), the Net, own brain." (M24).

By looking for what source was first mentioned in the answers the following observations can be made. People and social networks were the preferred source mentioned by 12 interviewees. People included here in particular customers as well as subordinates, colleagues and the experts in own organisation. Next came sources for organised information (eight interviewees) including the services of own Business Intelligence processes and the electronic media. Four interviewees mentioned analyses by outside consultants first. Two interviewees mentioned books and papers first.

People thus seem to be in the major role as a source of information for this group of managers. This may reflect back to the issues of credibility and understandability of information as discussed in Section 9.6.1.3. One may conclude that, ideally, information needs to have a face, a personal source (to asses its credibility). Additionally it should have the ability to interact, explain and relate (for understanding).

9.6.2 The BRIEFS Related Themes

9.6.2.1 The BRIEFS Refinement Process



Score : P = 19, D = 7, N = 0

(P = Positive, D = Doubtful, N = Negative)

The majority of the group (19) regarded the BRIEFS refinement process very logical.

At this stage of the interview the overall reactions ranged from the positively thinking

"Logical chain. This is the way it should be." (M19),

"This is logical." (M9), and

"Makes sense." (M21)

to the more sceptical:

"Hard to materialise spirit. Is this possible in practice: show me." (M7),

"Good idea but is it realisable, utopia? Very logical." (M16), and

"Does machine do this? Interesting." (M2).

The managers brought up many detail aspects. Some saw the potential benefits of such a system:

"Offers help when in lack of time to process systematically lots of information." (M21),

"Useful if you want to detect something early: increase or decrease." (M10),

"Could bring value to BI with a correctly tailored base." (M4), and

"Idea is to speed up the processing of relevant data. Also consistency and not tiring." (M5).

Some considered the operational and more practical aspects:

"Somebody needs to take care of the process." (M5),

"Not a management tool. Somebody needs to massage data and present results in a simpler format to management. A tool for an industry consultant?" (M4),

"It must be possible to edit the knowledge base. Relation to time. New news may cancel or correct." (M20),

"Who decides: the process of an analyst." (M15).

Some presented reservations and doubts about such a system:

"Do not confuse with knowledge in the Nonaka sense (= wisdom). The process itself does not produce strategy. It is the interpretation." (M21),

"What is the weakness? Difficult if you do not know what to detect." (M10),

"Suspicious about the possibilities of machines. Words vs. profound understanding." (M16),

"How can we prove that the Knowledge Base (KB) is true? There is no absolute truth. Interpretation in the appropriate context and detection of tacit knowledge is the challenge. Connection to source must be maintained." (M17),

"Do coherent ontologies result, how change? (M26).

9.6.2.2 Sample Scenarios

Type of Entity	Single Message Event	Series of Messages State	Aggregation
Person	Nomination	Current employment, current encumbent	Career, churn in company
Product	Annoucement	Current offerings	Product trends
Company	News about deal	Deal status	Company strategy and success Industry structure
Company	Mention in news	Current tone	Presence in the media
Employment offering	Announcement	Success to fullfil	Company strategy
Technology	News item	Applications reported	Investment trends
Plant	Capacity action	State of plant	Manufacturing capacity & strategy

Score: P = 23, D = 3, N = 0

(P = Positive, D = Doubtful, N = Negative)

There was a general agreement that the scenarios presented are relevant (23 interviewees). The analysis of single messages did not receive much attention; it was the aggregation of the messages that was considered most useful:

"Aggregation is where added value can be found. Single message follow-up does not give much." (M4),

"Lots of information can be gained through monitoring in time. Product launches & announcements show strategic direction. Many things can be read from this kind of information. Also employment information is useful. Relevance increases over time dimension." (M21).

Some doubts or reservations were expressed:

"Possible in theory. What is the practical value?" (M23),

"These could be one part of truth but one does not know whether it is good or bad and how complete or incomplete. Superficial information?" (M7),

"Yes, good examples. Does market picture/understanding emerge? (M9).

Many detail considerations were brought up. The necessity to know the topic and the need to have a question was one:

"Needs to know the topic." (M7),

"Objectives need to be known." (M5), and
"A professional's tool. Need to have a question." (M15).

The availability and significance of source data was considered by several:

"Listed companies have to divulge this type of data." (M6),
"Advertising on the increase because of added reliance on partnering." (M11),
"Several kinds of news streams are needed (Reuters Business Briefing, e-mail, …). Source critique is needed." (M20),
"Public vs. unconfirmed information. Grey vs. public picture. Take the Net vs. press. In the Net filters do not exist. (e.g. compare f…d company.com vs. Reuters). Need to understand intentions, quality and what is interesting, what is representative." (M26).

Some stressed the important role that humans should play:

"Interpretation by human is important because the same fact may have many names or can be expressed in many ways. Ideas are good. The process is useful. Humans will always be needed, though." (M6),
"Psychological reactions cannot be followed." (M22).

New types of information extraction requirements were brought up by some:

"Detection of new ways of operation: these are the winners. E.g. IKEA, cheap flights,…." (M10),
"Consequences of acquisitions from the owners point of view. Management speaks nice things before and even after. Do they come true?" (M2).

Some considered the practical application:

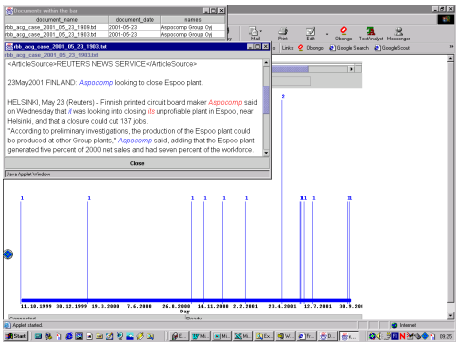
"Could be developed into competitive analysis. Some of these are dependent on the industry. Zero-sum game industries do not need." (M16),
"Challenge is to find good application areas. Difficult on the general level. Useful at some specific levels, e.g. persons to head hunter, presence to communications department." (M19),
"An induction tool. Maybe could be used as a tool in training for the industry." (M4)

Combination with other data and capability for anticipation and detection of change were requested:

"Could anticipation be implemented?" (M24),
"Prediction of competitive actions by following up their acquisitions. Combine with financial information." (M25),
"Extrapolation should be possible. Challenge to know early, before the deal occurs. Facts tell what has happened. Deviations from linearity, what has changed, what is different, what is wrong." (M15).

9.6.2.3 Selected Screenshots

9.6.2.3.1 Frequency



Score: P = 24, D = 2, N = 0

(P = Positive, D = Doubtful, N = Negative)

This report type did receive common appraise (24 interviewees):

" Handy way of presentation." (M7),

" Handy visualisation. Own gut feelings are reaffirmed." (M11),

"Time dimension relevant for visualisation. If sufficiently intuitive people will follow-up and notice change." (M4),

"A good way to gain background information fast." (M24),

"Good tool for the Intranet. To browse through news by clicking, e.g. view competitors. Beginnings of corporate memory." (M5).

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Necessary prerequisites were mentioned:

"The fact to be followed up needs high frequency, low can be traced manually." (M19).

The significance of the sources used were brought up:

"It is necessary to understand what sources have been used." (M2),

"Bad news get reported easier." (M12)

Related to this trust was brought up by some:

" Trust is important: need acceptable precision and recall." (M1)

Some suggested improvements to the report:

" X-scale could also be other than time." (M14),

"Good if combined with other information." (M10),

"Need 3D and interaction. This is a difficult User Interface. It should be possible to show relations between facts and how they develop." (M22).

"Nice and logical. Ability for more complex searches would be nice. Could even be used to anticipate launches." (M9)

"Exception reporting desirable. E.g. what is not normal?" (M16)

"Refinement analysis is wanted." (M15)

Some considered uses of this type of reporting:

"Could be used for e.g. competitor surveillance." (M23),

"Important because a publicly listed company must be seen publicly." (M6),

"Could be used to help determine whether time is right. Also if we are too early." (M8),

"If user is well informed may not create added value." (M4),

"Should be a new thing that must be analysed." (M14).

Commercialisation was pondered by some:

"So many things have to be right for this to work commercially." (M26)

The fact that conclusions eventually need to be made was, again, emphasised:

"However, what is the so-what, management implication?" (M19),

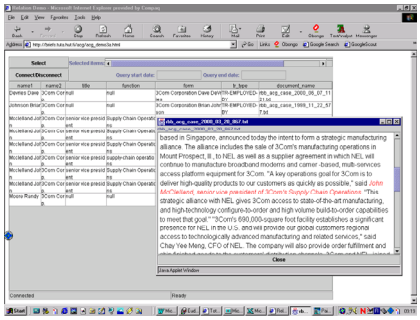
"What conclusions can be made?" (M16),

"Raw information in real time. Then analysis by people. Must know the domain and be capable of making conclusions." (M17)

The need to persevere was mentioned:

"Continuous use increases learning and the ability to interpret." (M17).

9.6.2.3.2 Relation



Score: P = 20, D = 6, N = 0

(P = Positive, D = Doubtful, N = Negative)

This report type was in general considered relevant and useful by 20 interviewees:

"This kind of information is needed. It is a hard job to dig this up by hand." (M21),

"The larger information masses become the more useful these kinds of robots become because humans cannot cope anymore." (M22),

"Understand and regard as a significant technique to solve problems related to strategic information." (M9),

"This is surely very good. Systematic vs. intuitive." (M16)

Some boundary conditions were expressed:

"If large volume and narrow scope then good." (M14)

Impact to own work was considered:

"Interesting. Clarifies. This is a pre-reader for me, does the raw job." (M2),

"Eases picking-up and sorting of facts and enables further analyses." (M24)

Some (six interviewees) could not quite see potential uses or were doubtful about uses in the strategy process:

"Where is this information useable? Could be a good idea." (M6),

"Depends on what kind of relations can be found. Maybe some are important." (M5)

"Heavier than previous. No direct application but necessary step." (M18),

"This is more operational?" (M11),

"Could be useful in some situations. But is it strategic?" (M15)

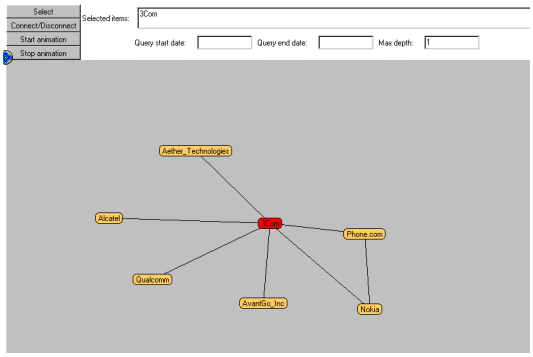
Ideas for improvement were, again, presented:

"If relations between people mentioned in the text can be found then there is even more value. What group does what?" (M22)

Other potential uses were suggested:

"Useful also in fields other than strategy: head hunter." (M25)

9.6.2.3.3 Deals of a single company



Score: P = 26, D = 0, N = 0

(P = Positive, D = Doubtful, N = Negative)

All interviewees can be said to consider this report as relevant and valuable:

"This could be valuable." (M23),

"Interesting. Big help. Quick analysis possible. Can process many sources." (M20)

"First class as a presentation. One can learn to read this well at one glance. Text must be read in toto." (M17),

"Important on the road to networking economies. Can track and focus and reach evidence. Companies are increasingly interested because of "messy" world." (M19),

"Often alliances are left unobserved. Important information." (M5),

"This, if anything, is strategic information." (M6)

Some stated limitations or qualified the applicability of the system:

"Deals have to exceed certain threshold in order to be reported. Where do we get the information for smaller deals? E.g. when I buy a new car or visit supermarket. This works in certain kinds of industries." (M16),

"One has to keep in mind that machines do not think. This is a kind of tool." (M2).

Some stated the potential benefits of the system:

"Speeds up work. People who do this by hand are plenty. What is their methodology? Not very structured perhaps." (M2),

"This is a method to collect data for the strategy process in a systematic form as much as possible." (M5)

Some suggested improvements or other uses:

"Timeline of orders is also important. The report does not describe quality/type of deal." (M4),

"Include time dimension or location." (M26),

"Add colour coding." (M14),

"Include size of deal in picture." (M21),

"Going in the right direction. Again, 3D, interface for simplified presentation to a human." (M22),

"Visualising change and prediction are important." (M19,)

"Use also for persons, products, product groups." (M12),

"Add evolution, filters." (M13),

"Exciting idea for further development is to input a scenario that would be analysed for feasibility or conflicts." (M5).

Interpretation of the picture was considered:

"Really good. One can see competitor's strategy. Interpretation from the buyer vs. seller point of view." (M9)

The question about the sources of information and the reliability of the system was again brought up:

"Press releases are bleak. Internet Bulletin Boards could provide good sources. They are very specialised and need to be known/found out." (M4),

"Important to realise what cannot be observed from individual messages. Needs further analysis." (M12),

"What is the reliability of the results?" (M1)

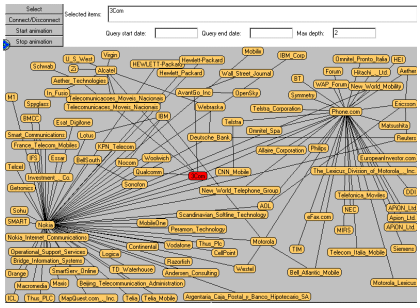
An estimate about maturity of the technology was offered:

"This is the next tool for monitoring the networking world and supply chains, 10 years from now. Could also be applied to processing reclamations in 5 years time (e.g. classifying them). This is a difficult field, analysis of text." (M25)

Potential users were suggested:

" Useful for investors." (M1)

9.6.2.3.4 Accumulation of Deals to Reveal Industry Structure



Score: P = 21, D = 5, N = 0

(P = Positive, D = Doubtful, N = Negative)

The majority of reactions to this picture were basically positive (21 interviewees):

"Impressive." (M23),

"Important information for an investor. Helps to understand totalities and state of world." (M22)

"Interesting result. Applicable widely. All companies are networking increasingly. One picture is very informative." (M19),

"An interesting picture. Dependent on industry. Not always as dynamic." (M8),

"Easy to grasp. Very interesting, strategy oriented way of presentation." (M9),

"This would be hard to collect by hand. Hard or even impossible as a one time manual effort. This would be enormously useful and helpful. Understand the idea. " (M5)

"Is this real data? This is very interesting information. Law of big numbers brings up essential facts. This would be very useful." (M6)

The dependency of the source and domain are again commented:

" Dependency on source has to be evaluated." (M16),

" Source data is critical, good coverage, high quality required." M15)

"Companies start to hide information because they know competitors can interpret. Not everything is divulged. Information that companies want to hide is strategic." (M6)

Some objected to there being too much information:

"Frustrating: Shows focal points but in general too much stuff, needs filtering." (M2),

"It is necessary to filter e.g. by industry, geography, size. There is too much here. I would limit to certain companies, certain industries." (M20),

"This is in the other extreme end. Does not open up easily. Must dwell on this." (M17).

Some needs for further development were expressed:

" Interesting. Should allow for further drilling." (M24),

"Very interesting, strategy oriented way of presentation. Add interactivity." (M9)

Some noted dangers and limitations in applicability:

"Exciting. Works when lots of transactions." (M10)

"Large amount of information leads to inviting comments. Dangerous if not enough of topic is known. Background knowledge is necessary for interpretation." (M7),

"Useful. Interesting. For a domain we do not yet know about." (M14).

"Not useful as such. Could be used as a navigation tool." (M18).

The need to observe change and dynamics was expressed:

"Describes situation at a certain time. Could now be different, e.g. Microsoft should now be more prominent." (M4),

"Good picture, ideal example, dynamics to be added." (M26)

The need to draw conclusions was expressed:

" Conclusions?" (M16),

The potential benefits came up again:

"Should be updated automatically. Saves lots of useless effort. Good if wide coverage and continuous. Ad hoc exercises are not needed. Can also improve quality, availability and reliability." (M21),

"Would take weeks to do by hand." (M3),

"Tool for business analyst. Tool for media monitoring companies: how something is treated in public." (M15).

A view about a possible business model was offered:

"An ASP (Application Service Provider) business model would be best." (M22),

9.6.2.4 The Knowledge Base and Complex Queries

- A particular company as a participant in a deal
- A new (to knowledge base) company as a participant of a (particular type of) deal
- A new type of deal for a company
- Deal structure (strategy) of a company at a point in time
- Progress (change of status) of a particular deal
- Change in the deal structure (strategic direction) of a company over time
- Events in a geographical region
- Structure of a business group
- Events in a business group

Score: P = 21, D = 5, N = 0

(P = Positive, D = Doubtful, N = Negative)

The idea about the knowledge base and the examples of complex queries received a positive response from 21 interviewees:

"Fascinating. If massive enough and good coverage could be useable." (M23),

"All these questions we face. Very relevant." (M25),

"These are even more valuable because more refined analysis. Absolutely logical." (M20),

"Strong if you get a result and see the underlying evidence (can do source critique)." (M18),

"Some of these are very valid. Could lead to a new type of fast reading scheme because have access to original evidence." (M7),

"A tool for us, for our editors." (M26)

Some reservations came up:

"Profound queries not yet possible. For big businesses. Not for my industry in Finland." (M10),

"Case by case for special cases. Is this possible in practise? Results in vast number of variables. This kind of information is useful in many situations but is it possible in practise." (M6),

"Demands a lot from the user. Understanding is needed as to what can happen so that something is not left outside. Clear if for own internal use. It is important to review source material every now and then." (M17)

"How can one trust this: aggregation more reliable than single cases. Useful in situations which are not followed up daily - which are not familiar. Large volume required." (M14),

"Useful. What are people's expectations. If a crystal ball then disappointed." (M4),

"Assuming source material is comprehensive and correct. E.g. Enron did not give correct public information. Analysis of correctness of information is not there. Cannot relinquish own filters. All models have boundary conditions. Does not diminish potential value of this system." (M2).

Some prerequisites and considerations for use cases were again presented:

"The analyst must understand the domain." (M15),

"These need to be considered through real use-cases. E.g. do we want to enter certain markets? First, what decision needs to be made, then what do we need to make it. Generic query: tell us what competitors do is useless." (M4).

Several pointed to the potential benefits of this kind of system:

"Very relevant and interesting. Information can get drowned and not be detected. This can help control. If there is no information that also is information." (M21),

"Our own portal has a "somebody heard of this?" facility. People answer yes/no. Do we get all information is the question. This system could be a more comprehensive way to collect information. And non-partisan. Humans may produce higher quality information, but just may. And do they respond at all." (M16),

"Speeds up from a week to one day." (M25),

"If a company decides to implement it starts with all historical texts and feeds the process. Then current information is fed, as it becomes available. Somebody watches over the process. If systematisation and updating of vast amounts of data can be automated this would be many times more valuable than newspaper clipping service. Can not replace people but one pain in the strategy process is the collection of basic data. This could serve that process." (M5),

"Information Service is not highly regarded. If this could help make one good acute decision it would pay for itself many times over." (M9).

The availability and quality of information was considered:

"Product launches and deals are announced publicly. But company structures and persons are more difficult. However, companies have to become more and more transparent and have to release more information. This is why there will be more information available legally." (M21),

"World, markets not rational. Low sentiments lead. Seller and buyer agree the price and professionals justify it scientifically afterwards." (M2).

Further requirements and ideas were again presented:

"Continuous monitoring with alert levels." (M21)

"Forecasting is important." (M25),

"Combine with maps." (M6),

"Should be connected to financial information (e.g. resources for acquisitions). Capability to add own info should be added." (M9)

"Events in geographical region combined with frequency analysis to detect geographic emphasis." (M19),

"Idea for presentation for following up a single companies: simple main menu with some simple graphical vector indicators about expectations vs. reality. The analyst must understand the domain." (M15),

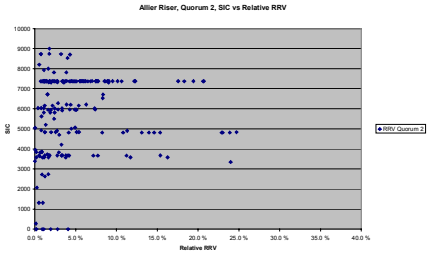
"One gets a good picture of a company. But what is the impact to own business? Profiling and assignment of roles to the competitive companies is needed. If the picture reflects reality man can see the role." (M11)

One interviewee pointed to a generation gap:

"Good examples. A senior executive should see these. There is a big knowledge gap. They should see the value of something like this. Maybe younger generations will do better." (M9).

9.6.2.5 Allied Riser and Industry Clustering

9.6.2.5.1 Allied Riser



Score: P = 18, D = 8, N = 0

(P = Positive, D = Doubtful, N = Negative)

This theme split the group into three: 1) those who had a basically positive attitude (n=18), 2) those that were doubtful (n=6) and 3) those that did not fully grasp the idea and thus did not have much to say (n=2, who actually were classified as "D").

The potential applications and uses mentioned included:

"Search for partners, partner networks. Synergy finder. Connections that would not be thought otherwise." (M25),

"Could be used in explorative situations." (M23),

"Could help understand and complement industry classification." (M11)

"Could this be used for analysis of ways of operation?" (M10),

"Could be useful if one needs to find out who are similar to company X (e.g. potential suppliers, subcontractors). Could be used as an alarm scheme if nobody else talks same language: tool for self-examination." (M4),

"Could be used to analyse value systems. Dynamics of something could be monitored." (M15),
"Interesting idea. If it is used by corporate communication the same language is needed to be used by companies in the same cluster. This is the validation of it.
Could be used in the development of networking and partnering. Value added is by finding networks of companies in Europe or Asia. We know very little about these: US is known better." (M22),
"Interesting. Could be used for early warning. Findings e.g. regarding industry convergence." (M19),
"For new domains" (M26),
"Useful because companies are not stable and they do not know everything. Could be useful in matching service concepts." (M14)

The benefits of this kind of processing would be in
"Waking up creativity, questioning, basis for reflection." (M25).

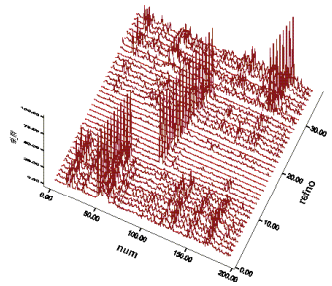
The doubting or cautioning comments included:
"If you are in this business and if you do not already know these guys you are in trouble. BI (Business Intelligence) is important as a backbone but the strategic aspect does not come out of these. One needs to go very focused and deep into a market, product, or even a feature in order to gain benefits from a tool like this." (M4),
"How to include black areas (not mentioned in text)?" (M24)
" Could highlight fashions or be confused by the use of trend words. E.g "content production". Have to be careful. This also very dynamic, changes in time." (M17),
"What are the terms that underlie similarity? (M13)
"Messages need to be understood." (M5)

The question of source was again brought up:
"Need good sources, better than press releases. Such as discussions in the Internet." (M4),
"IPOs deploy IPO language." (M10),
"IPO submissions not good material." (M1),
"SEC filings a good source of information." (M9)

The importance of domain understanding was brought up:
"User needs to understand the domain." (M15)

Requests for further development included:
"Should refine and have the ability to drill in the background to fully understand this." (M3),
"Time perspective missing." (M8)

9.6.2.5.2 Industry Clustering



Score: P =16, D = 10, N = 0

(P = Positive, D = Doubtful, N = Negative)

Overall the responses to this theme were similar to the previous one except that this time there were no no-responses.

Positive comments again concentrated on the kind of uses this type of analysis could be put into:

"Useful for an investor. Does it only reflect fashion? On the other hand reflects a trend." (M16),

"Good if investigating something: Could be used to detect borderline cases, expanders, competencies, synergies." (M10),

" Could determine industries if no prior information." (M20),

"Could be useful in competitive analysis. Could change opinions about competitors. Could also be used for e.g. product descriptions." (M24)

"Dynamics can here seen better here. E.g. change of Microsoft. Static is tactics or operative. Dynamics is strategic." (M15),

"Interesting - so what is needed. Could be useful to an investor." (M14)

"Understanding of competitive situation. Who are the most important, more alike. It should be possible to start and then follow-up a chain. Could be used for similar production facilities or same geographical area." (M12),

"I like this picture as technical representation. Illustrative. I could learn to interpret these." (M17)

The two most enthusiastic comments included many aspects and ideas. They are posted here:

"Utterly interesting. Good idea to analyse text. There is a lot of information in text when it is examined properly. Added value. Complementing and supporting analyses. May save time and effort. Aids in becoming proactive and in making conclusions. Supports intuitive decision-making. Continuous follow-up is important. Not fancy thinking but really useful cases. Amount of relevant information increases. May alert early, may give new interpretations. Good complementing information. Top management always gets answers but information base quality may differ." (M21),

"Useful in detection of change and in combination with IE observations. E.g. what is going to be the direction of the new Compaq/HP, what does IBM say, Bull of France?
In practise: most important competitors are known but… .
Like basic research: benefits not easily seen and may come from somewhere else.
A quiet analyst would assemble data. This could result in surprises to management in the strategy process. This is for waking up, making sure.
As such this picture is not surprising.
Could be useful to subcontractors.
Analyse most important customers and then find similar ones." (M5)

Doubting or questioning comments included:

"People know about their own clusters. Does not open to me. Need to understand what is behind the picture." (M4),
"Difficult to quickly understand how this could help planning at the group level. Perhaps could be applied to news streams?" (M20),
"Not immediately obvious how this could be exploited. Maybe some ideas could be gained." (M7),
" What are the underlying conceptual worlds?" (M13),
"Interesting exercise but needs to be given more thought.
This picture is too difficult. Perhaps it needs more clarification." (M22)
"Where to find users, applications? What is the so-what to management?" (M19),
" Does not open immediately. What uses could this be put to?" (M6),
" Should refine and drill in the background to fully understand this." (M3)
"How to make conclusions from this?" (M2)
" Noise may prove difficult." (M10)
" How to interpret these. New skills needed." (M24)

Requirements and ideas for further development or new application included:

" An informative overlay should accompany this picture" (M9),
"Follow-up of acquisition statements over time. An example hypothesis: cross-border acquisitions do not add shareholder value. Difficult to prove" (M2),
"Use for job advertisements: reflects expectations, profiles, material exists electronically." (M26)

9.6.3 The Summary Themes

- Would you implement?
- Conditions for implementation?
- How would you use?
- Would it make your work different?
- In what way?

In the Summary part of the interview we had the five questions which have been repeated above. Many interviewees did not answer them sequentially in this order. Rather, their responses tended to contain answers to several of the questions in the same sentence or line of thought. What follows is the author's rendition where the partial answers have been assigned to their appropriate question.

9.6.3.1 Would You Implement?

Looking at the responses to the Summary discussion as a whole the following observations could be made. The answers to the "Would you implement?" question are conditionally positive and affirmative. The majority (20) of the interviewees said they would be willing to implement a BRIEFS-like system if it existed. Even the remaining six interviewees considered BRIEFS as relevant research topic. There were no downright negative positions.

Generally positive answers to the "Would you implement?" question, in addition to a simple affirmative "Yes", included:

" If the product existed I would use in my own job." (M20)

"Without doubt. Formulation of strategy is very difficult. Usually follow ideas of the biggest boss. Earlier systems became too simplified." (M9)

"Why not. Data collection and systematisation and relevance evaluation is needed in any case and it needs looking after. Interesting case. Could become the biggest IS of a company." (M5)

Generally cautious comments to the question included:

"Possible in theory. In practise? Could it produce surprises? (M7),

"Fascinating and promising as a scheme. In early stages yet." (M23),

"Relevant research. Due to economic conditions cannot support right now." (M26),

"If I had the time, certainly. This is an important field" (M22),

"Leading edge. Cannot clearly see where all application domains are. "(M19),

"Not yet in this small company. But if were manager of a big company I would try" (M3)

9.6.3.2 Conditions for Implementation

As could be expected of prudent managers their willingness to go ahead was with the proviso that first some conditions are met and that some questions are satisfactorily answered. The conditions ranged from financial considerations to the way proof of the concepts should be accomplished to features that the system should have.

Some considered the financial and other resource requirements: the need for cost/benefit analyses, the pricing of service and the level of investment:

"Cost/benefit. Implementation should not take too much effort compared to benefits." (M21),

"Cost/benefit needs analysis. Length and difficulty of learning is one dimension of analysis." (M17),

"Reasonable pricing. E.g. not more expensive than Reuters Business Briefing (€ 800/month) or an assistants monthly salary." (M2),

"No major investment is anticipated." (M5),

"If I had the time, certainly" (M22)

Some reiterated their views about the applicability and the limitations of the system:

"Useful for new domain, large volume, pattern finding. For detail not reliable enough." (M14)

Statements regarding the reliability of the system, the need for further research and suggestions for accomplishing the proof of concept included:

"Promising results, need validation, needs further development" (M26),

"If precision/recall is acceptable" (M1),

"Proven track record, reliability record." (M10),

"Lots of research needed to verify results of the system." (M12),

"When modules are sufficiently advanced so that we can manage the system, e.g. in 2004/2005." (M25),

"Critical is the need to find questions BRIEFS can find answers for. These may not be very strategic, because in strategy intuition, tacit play a big role." (M4),

"Consider a genuine strategic situation and show how BRIEFS could be implemented and how easy it is to gain focused information." (M23),

"Try focus on a mass of data where useful conclusions can be made and see if they arise. Does it produce surprise? Data could be e.g. a paper I have been reading a couple of years or a bag of e-mail (e.g. 12000 messages). A good theory produces conclusions that would not have been made otherwise. If obviously wrong conclusions are made then it proves to be dangerous. Especially if applied to unknown field."

Some considerations centred on the requirements and way of implementation and organisation:

"Focused start. Results are needed soon. Needs to be defined clearly. " (M21)

"Assistants are needed. I would start by finding interested sponsors inside company, and these can be found. Need pull from the organisation." (M24),

"Question of culture. Core team must agree this is a good idea. Needs to be ascertained that an acceptable performance can be reached. Need an eager champion in the company. Can be tough in the beginning. " (M5),

"Commissioning is the critical step. Must be very motivating and show clear benefits quickly." (M17),
"This requires specialist support." (M9)

Availability of data was again considered:

"Data streams must exist and be available. IPR (Intellectual Property Rights) problems must be solved. In Finland the author has the IPR. This impacts the archives also." (M20),
"Availability of information needs to be secured." (M21)

The human aspect came up:

" Can be complemented by human entered information. Important facts and information must pass human brain. Should not be a system where a stupid human feeds the systems and presents results to management." (M5),
"Human side cannot be neglected. Machine cannot interpret data correctly." (M6)

Several required improved user friendliness:

"Should be easier to use and have better presentation." (M22),
"A product with a clear user interface which would produce clear summaries." (M12),
"Levels of ease of use are needed." (M17)

Special requirements and questions regarding the dynamics of the perceived phenomena were stated:

"If input is dynamic then output should also be. Must be capable of processing a lot of information from existing sources. Must be capable of highlighting dynamics." (M15),
"What if the world changes? What about old conclusions and facts?" (M5)

The requirement to adapt to company's IT infrastructure was stated:

"Needs to adapt to our IT architecture. No big hardware and software investments." (M21),
"Interfaces to other products and services needed." (M12),

The form of the service was considered. Some wanted tailoring, some outside service

"We do not develop the system self" (M25),
"Would not buy off the shelf but tailored carefully to own needs." (M17),
"Need somebody to offer service" (M18)
"Interpretation must be within company. Processing can be purchased." (M5),
"Need a service business that implements the idea and has a good network. Companies with explorative needs could use service if process right." (M23)

9.6.3.3 How Would You Use?

Many interviewees saw the system useful in Business and Competitive Intelligence activities:

"Company surveillance. Competitor analysis is always lacking. BRIEFS could lead to good factual analysis. In explorative situations." (M23),

"BI officers tool. Tracking of Internet discussion groups (because they influence)." (M4),

"BI services & archiving support tool" (M26),

"Continuous surveillance of environment with triggers. Mass analysis once a year." (M8),

"Continuous strategic monitoring. Something like this has been wanted. Strategy is continued until it is found not working. Need a clear picture." (M9),

"Own analysts could use as part of their work." (M19),

"Value system detection, early warning." (M15)

A more elaborate response was:

"If this worked then right use would be to gather new sets of information for refinement & have a new user interface. Trace to evidence important feature.

Use public material, written material, own email. The company is full of team-rooms and web-sites which one cannot peruse. Take Notes DB and Word-documents and try it. This could also be a way to revisit time wise fragmented information." (M7)

Some cited uses for better decision-making:

"We could use to analyse different groups and look for important factors to make better investment decisions." (M16),

"Continuous use. As a wake-up tool. As a question raiser. Wide coverage industry analysis." (M24)

Some again considered practical introduction:

"To start with a short presentation in every top management meeting about findings of this system (nominations, deals etc) and then refine it all the time. In the strategy round try to create framework using data from this system." (M5)

Some suggested other potential uses and users:

"Maybe narrow domains like head-hunting, communications research." (M19),

"As a teaching tool." (M24)

"New managers may be able to benefit." (M9)

9.6.3.4 Would It Make Your Work Different and in What Way?

Several interviewees did not see changes in their work but reflected improved efficiency and possibility for widening the scope of analysis:

"Not change but save time and effort: improve productivity." (M1),
"Would not change but would make it easier, speed up." (M15),
"More information can be processed, faster and visualised such that it supports intelligent discussion and decision making." (M4),
"Not as such. One additional support element and source for decision making." (M19)

One interviewee suggested that more work would result:
"More work will result because more facts emerge and can be processed. More facts would be checked and scrutinised than before." (M5)

More qualitative consequences were also seen:
"One would know more and have links to evidence. This could lead to better decisions. The examples here are not strategic conclusions but summary information." (M7)
" New depth, better concept schemes." (M26),
"More time for reflection with fewer people. Speed, efficiency. New creative solutions." (M25),
"Would speed up information gathering and give more time or more comprehensive analysis." (M22),
"Could help reduce subjectivity of analysis. Test whether we have we seen the right dimensions." (M11)

The consequences of a systematic and consistent approach were considered:
"Systematic monitoring could possibly change working process somewhat. Would release energy." (M21),
"Works and gives information faster, cheaper and more reliably than a human. Could partly replace very expensive consultant." (M3)

Even wider consequences were seen by some:
"Could make environmental scanning closer to business and part of everyday life. Could give earlier warnings and raise proactivity. Could start debates." (M24),
"Will eventually change the job description of the strategic planner and decision making." (M9)

9.7 Analysis of the Overall Attitudes Towards the BRIEFS Related Themes

9.7.1 General

The following analysis strives to give insight to the attitudes of the interviewees towards the BRIEFS System, and to the differences between their attitudes. We are particularly looking for answers to our third research question "is there a need for something like BRIEFS?"

The analysis is based on counting the frequencies of the assigned attitude codes (P, D, N) in each category for each person. Based on the scores of the positive category (P) we then classify a person's overall attitude towards the BRIEFS related themes as shown in Table 9-10.

Table 9-10 Classification of the overall attitudes towards the BRIEFS related themes

R = #P / n **#P = number of positive attitudes** **n = number of themes**	**Person's overall attitude**
R = 1	Positive
.85 ≤ R < 1.00	Rather positive
.65 ≤ R < .85	Somewhat doubtful
.50 ≤ R < .65	Rather doubtful
R < .50	Doubtful

We thus split the positive into two and the "doubtful" into three categories: No negative overall attitude was defined since there were no downright negative responses. We call people falling in the positive categories *believers* and the ones falling in the doubtful categories *doubters*.

The results of tabulation of the interviewees, based on the classification specified above, are shown in Table 9-11.

Table 9-11 Overall attitudes of the interviewees towards the BRIEFS related themes

Person's overall attitude (n = 9 themes)	**Number of interviewees**
Positive	4
Rather positive (one doubtful attitude)	10
Somewhat doubtful (two or three doubtful attitudes)	8
Rather doubtful (four doubtful attitudes)	3
Doubtful (more doubtful than positive attitudes)	1
Total	**26**

Thus just over half (14) can be said to have a positive overall attitude towards the BRIEFS related themes and the rest (12) are more doubtful.

If the themes related to statistical processing (Allied Riser and Industry Clustering) are omitted and we review the attitudes based only on the Information Extraction related themes then Table 9-12 results.

Table 9-12 Overall attitudes of the interviewees towards the Information Extraction related themes

Person's overall attitude (n = 7 themes)	Number of interviewees
Positive	9
Rather positive (one doubtful attitude)	9
Somewhat doubtful (two doubtful attitudes)	8
Rather doubtful (three doubtful attitudes)	4
Total	**26**

A more positive overall position thus emerges because many doubts seem to relate to the two statistical processing themes. In the following analysis, however, we rely on the overall attitude classification based on all the nine themes.

9.7.2 What Are the Differences between the Positive and the Doubting?

To understand what variables may affect the attitudes of the interviewees towards the BRIEFS System we have split the group of into two: the "believers" (14 interviewees), whose overall attitude is positive or rather positive and the "doubters" (12 interviewees) whose attitudes range from somewhat doubtful to doubtful. We have then enumerated the values of the background variables and the attitudes of the individuals towards the background themes in the two groups. We have additionally calculated a class difference or distance measure: the number of class transitions necessary to reach the configuration of the other group (or cover it in the case of the two groups being unequal in size) wherever a scale of the variable can be considered to exist. The assumption is that the higher the distance measure the higher the difference between the groups. We discuss the resulting analysis in the following subsections

9.7.2.1 What Do the Background Variables Explain?

The background variable configurations of the "doubters" and the "believers" are shown in Table 9-13.

Table 9-13 The background variable configurations of the "doubters" and the "believers". The codes are explained in the "Background variable" column.

Background variable	Group of "12 Doubters"	Group of "14 Believers"	Number of class transitions between the groups
Size of current company (Small (<100 people), Medium (<1000 people), Large >1000 people)	4S,5M,3L	3S,M,10L	6
Internationality of current operation (Domestic, International, Global)	5D,6I,G	4D,6I,4G	2
Top management experience (Yes, No)	8Y,4N	6Y,8N	2
Current participation in strategic business planning (Supports, Decides, Neither)	3S,8D,N	8S,5D,N	3
Major viewpoint : (Commercialisation, Internal Use, Financial)	C,9I,2F	4C, 9I,F	2
Research orientation (PhD)	1PhD	7PhD	6
"Outgoingness" (Extrovert, Neutral, Introvert)	8E,3N,I	5E,3N,6I	6
Age (Junior (<35), Mature (35-55), Senior (>55))	4J,4M,4S	6J,6M,2S	2
Pre-familiarity with project (None, Low, Medium, High)	6N,4L,M,H	,8L,3M,3H	8
Has grasp of potential technical problems (Low, Medium, High)	5L,3M,4H	2L,9M,3H	4

By examining the configurations of the two groups in Table 9-13 we note that they do not seem to differentiate by the following variables

- internationality of operation
- top management experience
- current participation in strategic planning
- major viewpoint
- age

The variables showing biggest differences in the two groups are

- size of company
- research orientation
- "outgoingness"
- pre-familiarity with the project and
- grasp of technical problems

In the following we examine the results with regard to these variables in more detail.

Table 9-14 shows the overall attitudes of the interviewees split according to the size of the company the interviewee represents.

Table 9-14 Overall attitude vs. Company size. $p(\chi^2) = 0.067$

Overall Attitude	**Company size**			
	Small	Medium	Large	**Total**
Positive	2		2	**4**
Rather positive (one doubtful attitude)	1	1	8	**10**
Somewhat doubtful (two or three doubtful attitudes)	3	3	2	**8**
Rather doubtful (four doubtful attitudes)	1	2		**3**
Doubtful (more doubtful than positive attitudes)			1	**1**
Total	**7**	**6**	**13**	**26**

According to the distribution above the large company representatives seem on the average more positive than the representatives of the smaller companies. If we regroup the answers to the positive and the doubtful on the one hand and the large companies and the small and medium sized companies on the other the probability of the χ^2 statistic is 0.018. It thus supports the argument.

As far as the research orientation of the interviewee is concerned we note that all but one of the PhDs interviewed tended to have a favourable overall attitude towards the BRIEFS System as Table 9-15 shows.

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Table 9-15 Overall attitude vs. PhD. $p(\chi^2) = 0.240$

Overall Attitude	**PhD**		
	No	Yes	**Total**
Positive	2	2	**4**
Rather positive (one doubtful attitude)	5	5	**10**
Somewhat doubtful (two or three doubtful attitudes)	8		**8**
Rather doubtful (four doubtful attitudes)	3		**3**
Doubtful (more doubtful attitudes than positive attitudes)		1	**1**
Total	**18**	**8**	**26**

If the interviewees are regrouped into the positive thinkers and the doubters the probability of the χ^2 statistic becomes 0.022 thus indicating support to our interpretation.

The cross tabulation between the overall attitude and the "Outgoingness" is shown in Table 9-16.

Table 9-16 Overall attitude vs. "Outgoingness". $p(\chi^2) = 0.282$

Overall Attitude	**"Outgoingness"**			
	Extrovert	Neutral	Introvert	**Total**
Positive	3		1	**4**
Rather positive (one doubtful attitude)	2	3	5	**10**
Somewhat doubtful (two or three doubtful attitudes)	6	1	1	**8**
Rather doubtful (four doubtful attitudes)	2	1		**3**
Doubtful (more doubtful attitudes than positive attitudes)		1		**1**
Total	**13**	**6**	**7**	**26**

The "Introverts" seem as a group to be the best "believers" whereas "doubters" are prominently present in the other two groups. We get support for this statement if we regroup the answers accordingly. The probability of the χ^2 statistic is then 0.048.

By combining the overall attitude with the pre-familiarity the distribution presented in Table 9-17 results.

Table 9-17 Overall attitude vs. Pre-familiarity. $p(\chi^2) = 0.798$.

Overall Attitude	**Pre-familiarity**				
	High	Medium	Low	None	**Total**
Positive	1	1	2		**4**
Rather positive (one doubtful attitude)	2	2	6		**10**
Somewhat doubtful (two or three doubtful attitudes)	1	1	2	4	**8**
Rather doubtful (four doubtful attitudes)			1	2	**3**
Doubtful (more doubtful than positive attitudes)			1		**1**
Total	**4**	**4**	**11**	**6**	**26**

One can see that the people who have no pre-familiarity with the project are the most reserved. If we regroup the answers accordingly into a two by two matrix, the "believers" and the "doubters" vs. at least some pre-familiarity and no pre-familiarity, then the probability of the χ^2 statistic is 0.003 thus supporting this statement. One explanation is that this could indicate that prudent managers in the no familiarity group are wary of technological hype and the concepts involved with BRIEFS are complicated such that more than two hours is needed to come to grips with them. On the other hand it is encouraging that people familiar with the project tend to believe in it.

By combining the overall attitude of the interviewee with the technical competence of the interviewee the distribution depicted in Table 9-18 results.

Table 9-18 Overall attitude vs. Technical competence. $p(\chi^2) = 0.491$.

Overall Attitude	**Technical Competence**			
	High	Medium	Low	**Total**
Positive		3	1	**4**
Rather positive (one doubtful attitude)	3	6	1	**10**
Somewhat doubtful (two or three doubtful attitudes)	3	2	3	**8**
Rather doubtful (four doubtful attitudes)		1	2	**3**
Doubtful (more doubtful attitudes than positive attitudes)	1			**1**
Total	**7**	**12**	**7**	**26**

There are no significant differences here but as can be seen the technically highly competent people and the people with low competence are more reserved than the medium competent people. We get some support for this if we regroup the answers accordingly. The probability of the χ^2 statistic is .045. One explanation could be the following. The technically competent people are technically oriented. They are more aware of the potential technical problems and deficiencies and thus tend to give them more weight than to the potential benefits. The people with low competence, on the other hand, feel unsafe with new technology and could be considered not quite to trust the system. The technically medium competent people are more business oriented and are not prejudiced one way or the other and may thus give more weight to the opportunities they see.

In this subsection we have discussed the background variables that seemed to make the major differences between the groups of "doubters" and "believers". To gain further understanding to the differences in the overall attitudes in the following we cross-tabulate and discuss also the overall attitude with the rest of the codified background variables.

Table 9-19 shows the distribution of the interviewees according to their overall attitude and the internationality of the company they represent.

Table 9-19 Overall attitude vs. Internationality of company. $p(\chi^2) = 0.632$.

Overall Attitude	**Internationality of company**		
	Domestic	International or global	**Total**
Positive	2	2	**4**
Rather positive (one doubtful attitude)	2	8	**10**
Somewhat doubtful (two or three doubtful attitudes)	3	5	**8**
Rather doubtful (four doubtful attitudes)	2	1	**3**
Doubtful (more doubtful than positive attitudes)		1	**1**
Total	**9**	**17**	**26**

The international or global company representatives seem to have a slightly more positive overall attitude than the representatives of the domestically operating companies. This is not supported by statistics, however. The probability of the χ^2 statistic is 0.484 even after regrouping.

The cross tabulation of the interviewees between the overall attitude and top management experience is shown in Table 9-20.

Table 9-20 Overall attitude vs. Top management experience. $p(\chi^2) = 0.699$.

Overall Attitude	**Top management experience**		
	No	Yes	**Total**
Positive	2	2	**4**
Rather positive (one doubtful attitude)	6	4	**10**
Somewhat doubtful (two or three doubtful attitudes)	3	5	**8**
Rather doubtful (four doubtful attitudes)	1	2	**3**
Doubtful (more doubtful attitudes than positive attitudes)		1	**1**
Total	**12**	**14**	**26**

The "No top management experience" group as whole seems less doubtful than the group with top management experience. One explanation could be that the people with top management experience best understand the wide scope and range of matters and interconnections thereof that are input to strategy work. They are doubtful that machines can ever handle this. On the other hand both groups have a significant number of believers. Statistics do not support this argument. The probability of the χ^2 statistic after regrouping is 0.225.

The overall attitude by the current role of the interviewee in the strategy process is shown Table 9-21.

Table 9-21 Overall attitude vs. Current role in strategy process. $p(\chi^2) = 0.436$.

Overall Attitude	**Current role in strategy process**			
	Decides	Supports	Neither	**Total**
Positive	2	1	1	**4**
Rather positive (one doubtful attitude)	3	7		**10**
Somewhat doubtful (two or three doubtful attitudes)	5	3		**8**
Rather doubtful (four doubtful attitudes)	2		1	**3**
Doubtful (more doubtful attitudes than positive attitudes)	1			**1**
Total	**13**	**11**	**2**	**26**

The group of people in the supporting role is more positive than the group of people in the deciding role. We do not get support from statistics to this argument, however.

The overall attitude by major viewpoint is shown in Table 9-22

Table 9-22 Overall attitude vs. Major viewpoint. $p(\chi^2) = 0.902$.

Overall Attitude	**Major Viewpoint**			
	Commercialisation	Internal use	Financing	**Total**
Positive	1	2	1	**4**
Rather positive (one doubtful attitude)	3	7		**10**
Somewhat doubtful (two or three doubtful attitudes)		6	2	**8**
Rather doubtful (four doubtful attitudes)	1	2		**3**
Doubtful (more doubtful attitudes than positive attitudes)		1		**1**
Total	**5**	**18**	**3**	**26**

It is hard to see significant differences between the groups. There is no statistical difference. There are "believers" and "doubters" in all of them. It is nevertheless encouraging to note that the group with a commercialisation point of view is positively oriented.

Table 9-23 shows the overall attitudes by age group.

Table 9-23 Overall attitude vs. Age group. $p(\chi^2) = 0.587$.

Overall Attitude	**Age Group**			
	Junior	Mature	Senior	**Total**
Positive	1	2	1	**4**
Rather positive (one doubtful attitude)	5	4	1	**10**
Somewhat doubtful (two or three doubtful attitudes)	4	2	2	**8**
Rather doubtful (four doubtful attitudes)		2	1	**3**
Doubtful (more doubtful attitudes than positive attitudes)			1	**1**
Total	**10**	**10**	**6**	**26**

It seems at the outset that the younger people as a whole have a more positive attitude and that the attitude turns more doubting as the age increases. Statistics do not support this reasoning, however.

9.7.2.2 What Do the Attitudes toward the Background Themes Explain?

We now examine the possible connections between the overall attitude and the attitude towards the background themes Table 9-24 shows the configurations of the attitudes of the interviewees towards the background themes.

Table 9-24 The configurations of the attitudes of the interviewees towards the background themes. The codes are explained in the "Background Theme" column.

Background Theme	Group of "12 doubters"	Group of "14 believers"	Number of class transitions between the groups
Mintzberg 1 Folklore (A=Agrees, R=has Reservations, D=Disagrees)	3A,4R,5D	4A,8R,2D	3
Mintzberg 1 Fact (A=Agrees, R=has Reservations, D=Disagrees)	11A,R	12A,2R	1
Mintzberg 2 Folklore (A=Agrees, R=has Reservations, D=Disagrees)	,,12D	,,14D	0
Mintzberg 2 Fact (A=Agrees, R=has Reservations, D=Disagrees)	12A	14A	0
Mintzberg 3. Folklore (A=Agrees, R=has Reservations, D=Disagrees)	6A,5R,D	10A,4R	2
Mintzberg 3. Fact (A=Agrees, R=has Reservations, D=Disagrees)	8A,4R	12A,2R	2
Mintzberg 4. Folklore (A=Agrees, R=has Reservations, D=Disagrees)	A,5R,6D	5A,4R,5D	3
Mintzberg 4. Fact (A=Agrees, R=has Reservations, D=Disagrees)	5A,7R	9A,5R	2
Keijola 1. (A=Agrees, R=has Reservations, D=Disagrees)	11A,R	13A,R	0
Keijola 2. (A=Agrees, R=has Reservations, D=Disagrees)	4A,2R,6D	3A,4R,7D	1
Keijola 3. (A=Agrees, R=has Reservations, D=Disagrees)	5A,4R,3D	8A,6R	4
Keijola 4. (A=Agrees, R=has Reservations, D=Disagrees)	4A,7R,D	4A,10R	1
Presentation preferences: first preference (G=Graphical, N=Numbers, T=Text, S=Speech, O=Other)	7G,N,3T,S	11G,N,,2S	-
Presentation preferences: numbers vs. text preference (N=Numbers, T=Text)	6N,6T	7N,7T	-

No distance measure has been calculated for the presentation preferences. The reason is that they do not form a meaningful scale.

When we look for further explanation from the configurations of the attitudes to the background themes we note that.several of the themes do not show major differences between the interviewees in the two groups. The three themes (Mintzberg 1 Folklore,

Mintzberg 4 Folklore and Keijola 3) that seem to offer additional information are discussed in the following.

Table 9-25 shows the overall attitudes of the interviewees split according to their attitude towards the Mintzberg 1 folklore theme.

Table 9-25 Overall attitude vs. Attitude towards Mintzberg 1 folklore. $p(\chi^2) = 0.215$.

Overall Attitude	**Attitude towards Mintzberg 1 folklore**			
	Agree	Reserved	Disagree	**Total**
Positive		2	2	**4**
Rather positive (one doubtful attitude)	4	6		**10**
Somewhat doubtful (two or three doubtful attitudes)	3	4	1	**8**
Rather doubtful (four doubtful attitudes)			3	**3**
Doubtful (more doubtful attitudes than positive attitudes)			1	**1**
Total	**7**	**12**	**7**	**26**

Many of the interviewees who disagree with the Mintzberg 1 Folklore theme are also more doubtful about BRIEFS. After regrouping the probability of the χ^2 statistic for this is 0.117 thus not supporting the argument. Most interviewees with a positive attitude tend to agree at least partially with the theme. This is not supported by statistics either.

The cross tabulation between the overall attitude and the attitude towards the science part of the Mintzberg 4 Folklore theme is shown in Table 9-26.

Table 9-26 Overall attitude vs. Attitude towards Mintzberg 4 folklore (science part). $p(\chi^2) = 0.596$.

Overall Attitude	**Attitude towards Mintzberg 4 folklore (science part)**			
	Agree	Reserved	Disagree	**Total**
Positive	2		2	**4**
Rather positive (one doubtful attitude)	3	4	3	**10**
Somewhat doubtful (two or three doubtful attitudes)	1	4	3	**8**
Rather doubtful (four doubtful attitudes)		1	2	**3**
Doubtful (more doubtful attitudes than positive attitudes)			1	**1**
Total	**7**	**12**	**7**	**26**

The interviewees who agree with the theme also have a positive attitude. This is not statistically fully supported, however. The probability of the χ^2 statistic is 0.099. The ones who disagree are divided.

The cross tabulation between the overall attitude and the attitude towards the Keijola 3 theme is shown in Table 9-27.

Table 9-27 Overall attitude vs. Attitude towards Keijola 3 folklore. $p(\chi^2) = 0.379$.

Overall Attitude	**Attitude towards Keijola 3 folklore**			
	Agree	Reserved	Disagree	**Total**
Positive	2	2		**4**
Rather positive (one doubtful attitude)	6	4		**10**
Somewhat doubtful (two or three doubtful attitudes)	4	3	1	**8**
Rather doubtful (four doubtful attitudes)	1	1	1	**3**
Doubtful (more doubtful attitudes than positive attitudes)			1	**1**
Total	**13**	**10**	**3**	**26**

According to the results above those who disagree with the Keijola 3 theme are also the most doubtful. The probability of the χ^2 statistic is 0.047 thus expressing mild support. Those who are positive on the other hand do not disagree with the theme. This is a somewhat surprising result which would need further investigation although it is not statistically supported.

9.7.3 Summary of Overall Attitudes

We can now summarise the characteristics of the likely "believers" and the likely "doubters". There exist some particular characteristics that seem to classify some but not all of the managers into one of the classes. In addition more general profiles of the two classes can be identified.

If a manager is

- highly educated (has PhD) or
- an "introvert"

he or she is likely to be a "believer".

More generally a "believer" probably but not necessarily has two or more of the following characteristics: He or she

- represents a large company (there was a suspected dependency between the introverts)
- is at least somewhat pre-familiar (i.e. excluding no familiarity) with the BRIEFS System
- is at least partially sympathetic to the Mintzberg folklore themes that a manager is a reflective planner and that management is becoming a science
- does not disagree with the Keijola theme that the most important strategic information is not on paper

A "doubter" on the other hand is first of all not a "believer". If he or she

- is not at all pre-familiar with BRIEFS

he or she is likely to be a "doubter".

More generally he or she probably but not necessarily is a combination of two or more of the following characteristics

- is not an "introvert"
- is a decision maker
- does not represent a large company

9.8 Summary of Management Feedback

We can now summarise the answers we have received to our research questions in this interview study.

9.8.1 What kind of computer based tools exist to support strategy work?

The existence of computer based tools did not much come up in the interviews. Tools that were mentioned were either basic, such as Excel and PowerPoint, or related to retrieval and dissemination of information.

9.8.2 Are the Tools Used?

It was evident from the discussions concerning the Mintzberg and Keijola themes that computer based tools, apart from those referred to above, are not widely used.

9.8.3 Is there a need for the tools?

A need for better computer-based tools could be detected. The emergence of a networking society was cited as one particular reason for giving rise to the need. Managers who were familiar with the BRIEFS ideas believed in the concepts and indicated willingness to implement if it existed as a product. On the other hand there were doubts as to what extent can a computer system excel in supporting strategy work and perform tasks where humans have so far been considered far superior.

Practical applications, in addition to strategy work proper, that were specifically mentioned included applications such as

- Competitive analysis, competitor surveillance
- Business analysis
- Industry analysis
- Brand tracking
- Industry induction/training

Suggested appliers included

- Business analysts
- Industry consultants
- Head hunters
- Media monitoring companies
- Communications departments
- Investors
- Editors

9.8.4 What Are the Requirements for the Tools?

The statements by the interviewees that could be construed to present requirements for a future system, i.e. provide answers to our fourth research question, are in the following grouped and characterised under three main headings:

1. The benefits that are expected of the tools
2. The reservations and considerations which must be overcome or addressed
3. Specific requirements indicated by the interviewees

We have here dropped references to the persons expressing a particular requirement. We maintain that all requirements have to be seriously addressed regardless of the person expressing it.

9.8.4.1 Expected Benefits

The expected benefits highlight, at the highest conceptual level, the needs and the uses a BRIEFS like system would be put if it existed.

1. As an information processor the system would:
    - Process masses of information from multiple sources
    - Be systematic, consistent, persistent, impartial
2. It would improve productivity:
    - Save time and effort, speed up processes
    - Act as a pre-reader, fast reader for a person
    - Ease pick-up of facts, sorting and further analysis
    - Enable exercises that are hard to do by hand
    - Enable more facts to be processed
3. It would lead to improved quality:
    - Knowing more, with more links to evidence
    - New depth, better concept schemes
    - Save information from getting drowned, improved control
    - Give more time for analysis and reflection
    - Find unusual, new connections
    - Trigger questions and creative thinking, start debates
    - Support innovation and intuition
    - Support early warning

4. In an organisation it would:
    - Increase the value of the information services function
    - Bring environmental analysis closer to businesses

Ideally the system should support decision-making. It should

- Highlight deviations and exceptions, provide for alert levels (e.g. vs. plans)
- Implement extrapolation from results, anticipate:
    - E.g. prediction of competitive actions
- Help determine whether time is right, early or late
- Provide the so-what, conclusions, the impact to own business
- Cater for dynamics and change

The role of the human should be understood: the final interpretation is by a human. The system should support people in their job, it cannot do their job.

9.8.4.2 Reservations and Considerations That Must Be Addressed

Reservations and considerations represent conditions that the system should meet to be accepted. These include the issues of trust, the usefulness of the system, the limitations that have to be understood, the knowledgebase, and the impact of the sources of information.

1. For the system to be trustworthy it is necessary to
    - Have an acceptable precision and recall in Information Extraction
    - To ascertain and maintain the correctness of the knowledge base
    - Produce explainable results: there is a need to know the underlying rules and terms
    - Provide results soon after commissioning.

2. For the system to be useful it is necessary
    - To know what to look for: topic, objectives, to have a question
    - To have a user who is informed on the tool and the domain
    - To present results in a simple format for management.
    - To provide interpretation of the reports

- To demonstrate that its benefits exceed its costs
- Suggestions for how to prove that the system is trustworthy and useful included:
  - List questions BRIEFS can find answers for
  - Consider a genuine strategic situation and show B could be implenented and how easy it is to gain focused information
  - Try to focus on a mass of data where useful conclusions can be made. Does it produce surprises? A good theory produces conclusions that would not have been made otherwise.

3. Potential limitations of the system include
   - High frequency of extracted information is needed
   - Zero-sum game industries do not benefit
   - New domains and narrow scope are OK, not well known ones
   - Could just highlight meaningless fashions
   - Vast number of variables may lead to practical inapplicability
   - Profound queries are not possible
   - There will be black areas, areas for which information have not been found
   - It can be dangerous if not enough of topic is known

4. Issues related to ontology and the knowledgebase include the questions of:
   - Does coherence result?
   - How to handle changes in ontology and subsequently in the knowledgebase?
   - What about old conclusions and facts?

5. Regarding the sources of information it is necessary to understand their limitations
   - Availability and IPR (Intellectual Property Rights) questions must be solved
   - Trust and dependency of the source: its coverage and its quality
     - E.g. source can be official or "gray"
     - E.g. deals have to exceed certain threshold to be newsworthy
     - E.g. bad news get reported earlier
     - E.g. IPOs talk IPO language
   - How to handle noise?

9.8.4.3 Specific Requirements

Here we list the specific requirements and suggestions that emerged from the interviews. Compared to the previous list this is more of a wish list.

1. Sources of information should include
    - Multiple news streams
    - In addition
        - E.g. Internet Bulletin Boards are informative
        - E.g. Job advertisements can be useful
2. Requirements for the use of the system, the results and the reports include
        - Ability to choose the scales of the reports
            - E.g. X-scale other than time
        - Combination of information from knowledgebase with other information:
            - E.g. financial, maps, own data

- Improved presentation
- Provide an informative overlay
- Show results in three dimensions
- Timelines, location & quality indicators, e.g. in deals report
- Colour coding, size indication
- Visualise change, evolution
- Allow for interaction
- Filters
- Drilling and refinement analysis
- Complex searches
    - For a single company: a report with indicator vectors
- Automatic updates
- Enable levels of ease of use

3. Operational aspects include

- Need to connect to source data
- Needs to adapt to extant IT architecture
- Interfaces to other products and services are needed
- Somebody needs to take care, specialist support needed

- Somebody needs to edit the knowledge base for correctness

4. New ideas and types of detection requirement include
    - Detection of new ways of operation
    - Identification of value systems
    - Search for partners and synergies
    - Detection of relations between people in text: to identify groups of people associated with a theme or a fact
    - To change point of view
        - E.g. Sellers or buyers point of view
        - E.g. Owners point of view: follow-up of acquisition statements over time
    - Profiling of a company and giving it a role in the business game

5. Regarding the business model for a system and service based on BRIEFS-like product it was suggested that an ASP based model (Application Services Provider) will be needed. At the same time it should be realised that processing can be purchased but interpretation must be within company.

9.8.5 Conclusion

We have in this chapter described what feedback management gave us about the BRIEFS System, its uses and its usefulness. We did receive many answers to our research questions in particular regarding new requirements for future systems. We can also say that the requirements of tolerance and flexibility which we identified in Chapter 4, received support as is summarised in Table 9-28.

Table 9-28 Expressed support for the original requirements

Requirement	Support Expressed in the Interviews
1. Flexibility for accommodating changes in the environment and in the attention of business	Yes
2. Flexibility for changing strategic paradigms, to allow for deployment of new concepts in strategy	Not discussed, not mentioned
3. Flexibility in bringing a rich and open set of data into a decision making situation	Yes
4. Tolerate masses of irrelevant data and arrive at the best capta, set of relevant data	Yes
5. Tolerate incomplete and inaccurate data	Yes
6. Tolerate and be flexible about the uncertainty of future outcomes, allow for the possibility of dynamic multiple futures	Yes
7. Tolerate and be flexible about differences in inquiring organisations	Indirectly yes
8. Accumulate timely and comprehensive information and manage dynamic knowledge	Yes
9. Process and synthesise multiple views in an unbiased way.	Yes

The overall need for s*upport for making sense of huge, complex and dynamic data for complex and dynamic decision making situations* was seen in the interviews when e.g. the Mintzberg 3 and Keijola 1 themes were discussed.

Did we find evidence about the two working modes, hypotheses testing and inductive? The discussion around the Mintzberg 1 theme could be interpreted to give evidence about the modes. The inductive mode is the default. The hypotheses testing mode exists to lesser degree, too, and there is a desire to operate in it more often and in a more disciplined way.

Is the BRIEFS System good enough tool for finding out managerial considerations for supporting system? We claim we did not receive any responses that would have refuted such an assumption. Together with the background themes we had a package that surfaced many managerial requirements that maybe had been ignored by too

much emphasis on technology. Although we cannot prove it here we suspect that more concrete and practical examples are needed to find out what managers really think.

The author alone has done all work with regard to the interviews. Subjectivity and objectivity of the analysis is thus a justified concern. To alleviate these concerns we have described our methods in detail and have tried to follow our chosen methods and schemes as systematically as possible.

In the next chapter we will further evaluate our results.

10 Evaluations

Support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.

1. What kind of computer based tools exist to support strategy work?
2. Are the tools used?
3. Is there a need for the tools?
4. What are the requirements for the tools?
5. What could be the solutions for the tools?
6. **Could partial and useful solutions be built?**
7. **What does management think about the partial solutions built and why?**

10.1 Introduction

We have described, in Chapter 7, the BRIEFS System that we have built and, in Chapter 8, what experiments we have conducted to test the system. We have, in Chapter 9, shown and analysed the responses managers gave us. We are now in a position to evaluate the BRIEFS System and discuss our findings. In a sense we return to our sixth and seventh research questions. We provide more answers to the sixth research question about the usefulness of our solution as well as to the "why" part of question number 7. We perform the evaluation by making use of the following three frameworks. We evaluate the system from the quality of information point of view, as a decision support system and as an innovation. We explain these frameworks in the following. We have not done specific experiments with regard to the frameworks to be presented here but reflect on and interpret our results in their spirit.

10.2 Quality of Information

10.2.1 Description

Lillrank (1997) addresses the *quality of information* and distinguishes between the quality of information itself and the quality of information systems. The quality of information itself has three attributes: reliability, validity and accuracy. *Reliability* refers to the relation between symbolic representation, data, and the actual states or events of the world (question from true to false). *Validity* is the fit between information and context (ranging from relevant to irrelevant), and *accuracy* the ability of information to trigger or enable action, learning and emotions (ranging from effective to ineffective).

The quality of information systems has three attributes; precision, flexibility, and ease of use. *Precision* is the ability to repeatedly hit the target. *Flexibility* is the ability of the system to redefine its targets in changing conditions, and it is measured as the time and cost required for an adequate response. *Ease of use* refers to the ease/difficulty of using an information system. (Lillrank (1997))

We will examine BRIEFS in the light of these attributes. It should be stated that whilst BRIEFS can be directly evaluated in some of these attributes it is also dependent on which uses it is put to. BRIEFS, within its capabilities processes text as the user has instructed it.

10.2.2 Evaluation

The *reliability* of the output of the BRIEFS System is primarily dependent on the reliability, relevance and coverage of its input material. If BRIEFS is given text from reliable sources the results can be expected to be reliable, within the constraints of the technical precision and recall of BRIEFS.

The results of BRIEFS can be said to be by definition *valid* in the sense that they are based on e.g. templates that are considered to describe the situation of valid interest.

We do not have measured data about the *accuracy* of the BRIEFS System. It could be said that BRIEFS might be accurate in the sense that it can assist in the raising of important questions regarding the business environment.

BRIEFS is very *precise* in the sense defined by Lillrank (1997). Given the same input material and the same rules it will produce same results. This is one of the advantages of BRIEFS and in contrast with processing by human beings.

BRIEFS is inherently *flexible*. However, at the moment we do not have reliable data as to the cost and time needed to adapt it to a new or changed environment.

No doubt our current system scores badly on the *ease of use*. It is suspected that ease of use is a particularly thorny issue for a complex system like BRIEFS.

10.2.3 Summary

BRIEFS could thus be said to directly score favourably in several attributes related to the quality of information. It can assist the user to produce quality information. Further research is needed especially with regard to the flexibility attribute.

10.3 BRIEFS as a Decision Support System

10.3.1 Intelligence Density Framework

Dhar and Stein (1997) introduce *intelligence density,* a concept and framework we can use for evaluating BRIEFS as a key part of a decision support system. It is different from but related to the quality of information concept in Lillrank (1997). Intelligence density is a heuristic measure to indicate the amount of useful decision support information that a decision-maker gets from using the output from an analytic system for a certain amount of time. It is a *productivity measure*. If an organisation can either *decrease* the time spent in making specific decisions and doing specific analysis without loss of quality, or *increase* the quality of analysis performed in a specific time frame, its resources can be used more effectively and productivity is increased.

Figure 10-1 shows the basic steps for how one can increase the intelligence density of a firm's raw data. The first step is to get access to the data. The data then needs to be cleaned up, integrated with some other data and possibly transformed to compound or aggregate units. New relationships in the data can then be discovered or known relationships can be applied in new ways. These newly discovered relationships could lead to learning. Apart from the first step of access to data the BRIEFS System attempts to perform at all these levels.

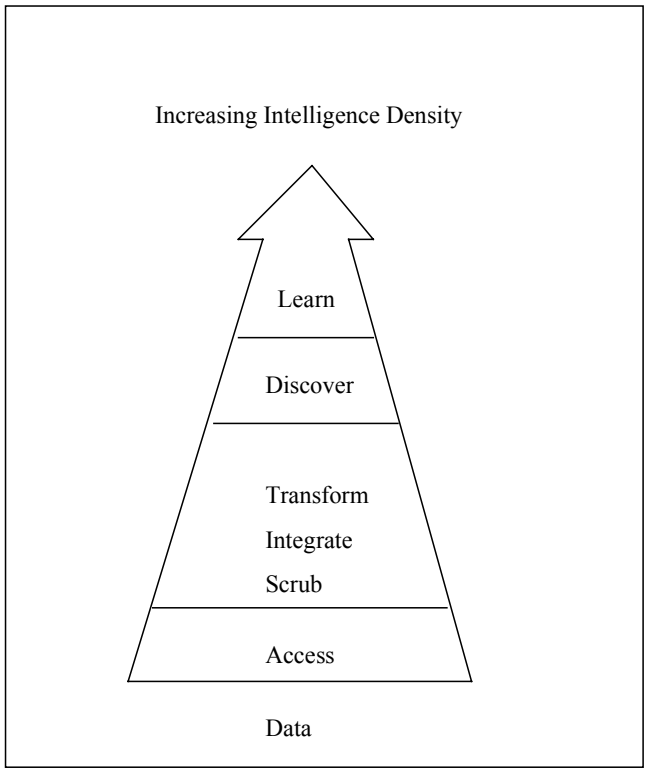

Figure 10-1 Steps for Increasing Intelligence Density (Dhar & Stein (1997))

Dhar & Stein (1997) define four dimensions of determinants of intelligence density. They are the *Quality of Model, Engineering Dimensions, Quality of Available Resources* and *Logistical Constraints*.

Quality of model includes factors which provide answers to the following questions.

- Does the system need to provide optimal solutions in terms of accuracy or goodness? (Accuracy).
- Does the decision-maker need to know how the answer was derived? (Explainability).
- Does the system provide responses within a reasonable amount of time? (Speed/reliability of response time).

Engineering dimensions include the following considerations.

- How flexible is the system in allowing problem specifications to be changed? (Flexibility)
- How scalable is the system? (Scalability).

- How easily can the system be embedded into a larger system or existing workflow? (Embeddability).
- How compact is the system? (Compactness).
- How easy is the system to use? (Ease of use).

Quality of available resources relates to organisational dimensions and includes the following considerations.

- Are there good, *high-quality,* electronic data available? (Tolerance for noise in data).
- Are there *a lot* of electronic data available? (Tolerance for sparse data).
- Is the organisation far enough up the learning curve? (Learning curve).
- How subtle and easily understood are interactions between problem variables? (Tolerance for complexity).

Logistical constraints within an organisation include considerations such as the following.

- What is the access to experts, or conversely, how independent are you from them? In particular, are experts readily available for advice and testing? (Independence from experts).
- Are the computing infrastructure resources adequate for the problem? (Computational ease).
- What development time can the organisation afford? (Development time).

In the following five sections we evaluate the BRIEFS System by making use of the Intelligence Density framework. The evaluation is based on the managerial feedback as well as on experience in the development of the system and the experiments we have performed. We tend to discuss the issues both from the eventual user-organisation's point of view and from the system developer's point of view.

10.3.1.1 Productivity

As was established in the interviews (Section 9.8.4.1) the BRIEFS System could increase the productivity of the strategy and business planning process. It would enable an organisation to cover a wider range of issues with the available resources

without loss of quality. It is poible also that analysis can be performed and decisions reached in shorter time frame. Further, the quality of decisions could increase because larger amounts of data can be processed. Especially if the strategy and business planning processes are issue driven the system could be of high value. We think a reasonable aim for the BRIEFS System would be to perform 80 % of the effort needed to collect business intelligence and compare the intelligence to the current beliefs with 20% of the current or projected effort. This, however, needs proof.

Several areas of business management where the BRIEFS System could increase productivity were identified in the interviews as was discussed in Section 9.8.4.1. These included competitive intelligence, communications analysis, follow-up and identification of events, discontinuities and trends in the business environment.

10.3.1.2 Quality of the Model

Does the system need to provide optimal solutions in terms of accuracy or goodness?
The BRIEFS System does not aim to bring absolute right answers. In fact, in strategy there are none. Imprecision in information and uncertainty about future prevail.

The quality of the model is dependent on the quality of the refinement chain, as we have discussed e.g. in Section 8.5.3. BRIEFS is also sensitive to the input it receives. It has no way of knowing whether the data is appropriate or that other data might exist.

Does the decision-maker need to know how the answer was derived?

The decision-maker has to be able to rely on the system and understand its answers. For this reason the algorithms and the rules used in the BRIEFS System are transparent. The user will be able to inquire about the source data, evidence, used for arriving at a conclusion and the rules used to reach that conclusion.

Does the system provide responses within a reasonable amount of time?

We do not have measured data to answer this question. Suffice it to say that the system is much faster than a human being in processing data once it has been set up for doing it. The slowest part is setting up the BRIEFS processes which currently can take considerable time, from days to weeks.

10.3.1.3 Engineering

How flexible is the system in allowing problem specifications to be changed?

Flexibility is an intended key characteristic of the BRIEFS System. The concepts of the Brief and of the belief/hypothesis allow the user to redirect the attention of the system. Changed interests, changed views, changed beliefs could be accommodated for. The system itself has been built in a modular way such that specific algorithms can be replaced with better ones as they come along. Measured data does not exist, however.

How scalable is the system?

At the moment there are no predictions about the performance of a BRIEFS System.

How easily can the system be embedded into a larger system or existing workflow?

Here is another key feature of the BRIEFS System. It is envisioned that it could be embedded in the existing strategy and business intelligence processes in organisations relatively easily. It does not require the users to learn or establish new paradigms for strategic planning or business intelligence. The users can continue their current ways of planning, using their current terms. Or they can adopt new planning practices and accommodate BRIEFS for that. The BRIEFS System is not dependent on the organisational levels either. From the technical viewpoint the system will have to interface with the news and other information services which we do not think a problem. These problems are not well understood at the moment. However, this is not a pre-requisite for a successful BRIEFS System.

How compact is the system?

See the discussion on performance. It is probable that the logic of the BRIEFS System itself will be very compact. However, the databases for business intelligence can grow quite big depending on the user.

How easy is the system to use?

At the moment it is difficult to use. It requires technical expertise. It may even require an understanding of linguistics.

10.3.1.4 Quality of Available Resources

Are there good, high-quality, electronic data available?

Data about business environment is available electronically from many reliable news sources. There is also less reliable data available electronically. Issues of copyright have not posed a problem so far but may do so in the future.

Are there a lot of electronic data available?

There is no reason to believe that there is going to be shortage of high-quality electronic data. It is quite possible that there is shortage for some specific data, though. This, however, does not present any problems for the system per se. The reliability of the results of testing a particular hypothesis will obviously suffer from sparse data but it does not affect the working of the system with regard to other issues for which there is data.

Is the organisation far enough up the learning curve?

The concept of the BRIEFS System is novel and does present challenges to the developers and adopters. Technically the issues are not difficult. Solutions for single tasks or components exist but the challenge is in the integration of them to a holistic system. Management of a BRIEFS based information system in the knowledge engineering and management sense does raise new issues for which there is little past experience. The strategic paradigms deployed in a company do not need to be changed.

How subtle and easily understood are interactions between problem variables?

The BRIEFS concept represents some novel and holistic thinking about gathering and exploiting business intelligence. The total concept is not complex. However, there are components that require sophisticated processing. The areas include how domain models are built from the Brief so that they are fully useful in the information extraction and hypotheses testing phases, how to control the relevance-ranking scheme, and what kind of testing schemes can be supported.

10.3.1.5 Logistical Constraints

What is the access to experts, or conversely, how independent are you from them?

In particular, are experts readily available for advice and testing? The setting up of the BRIEFS scheme will require initial expertise about the domain of interest. From the developers point of view it is expected that the adopting companies have and will provide expertise about potential application areas for the BRIEFS System.

Are the computing infrastructure resources adequate for the problem?

This is not currently considered a problem. It did not arise in our experiments. We have not specifically addressed the performance capabilities of our system but are aware of many changes that could increase its performance significantly. In addition our hardware is just standard PCs.

What development time can the organisation afford?

We do not have measured data for this.

10.3.2 Summary

In this section we have examined the BRIEFS System by making use of the intelligence density framework as defined by Dhar & Stein (1997). We have noted, in our qualitative analysis, that in several dimensions BRIEFS can be considered to score favourably. It could be expected to raise productivity in strategic decision making in companies. On the other hand we have also noted that in several dimensions controlled measurements are still needed and further work is still needed in many respects.

10.4 BRIEFS as an Innovation

10.4.1 Introduction

We have in Chapter 9 studied the managers' responses to the themes posed in the interviews. The analysis gave answers to our research questions about the existence, use and need for tools supporting strategy work. We have so far accepted the managers' responses at their face value. In this section we aim to provide a deeper analysis of the responses. Our question now is why where the responses what they

were? Can we detect some fundamental elements that explain or determine the managers' responses? Understanding these elements could lead to better guide future research and future development of BRIEFS in practise.

The idea of BRIEFS, the BRIEFS System and the way it can potentially be applied can be perceived as something new, unseen and untried before. The foremost aspect of newness is perhaps the possibility of intelligent text processing and subsequent knowledge creation by a computer. The managers who were interviewed were faced with this newness and their responses in the interviews could be assumed to reflect their attitudes toward new ideas, practices and products, in other words innovations.

There is an established research tradition in why and how innovations succeed or fail. This field is called *innovation diffusion research* (Rogers 1995, Spence 1994, and Larsen 1998). Although being a large field of study in social change some parts of it provide us a framework to reflect on the BRIEFS System and the managers' attitudes towards it.

10.4.2 Innovation Diffusion Research

Spence (1994) lists some typical questions that innovation diffusion research can provide answers to:

1. Are there any specific factors which can persuade an individual to accept something which is new?
2. What aspects of that new idea, practice or product are the most important and need to be emphasised?
3. What kinds of characteristics help to identify the probable adopters?
4. What worthwhile applications can I transfer to my own particular activities or occupation?
5. How can I make the most effective use of these in the light of current knowledge and techniques?

Diffusion is defined as the process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers (1995)). Innovation implies newness. Newness involves uncertainty. Adopting an innovation involves change. Change involves risk. Change encounters resistance.

Lack of success of an innovation comes from one or the other of two fairly common human shortcomings (Spence (1994)):

1. A failure of understanding - this is an inability to see how something can actually be achieved
2. A failure of confidence leading to a lack of real commitment. In this case there is undue hesitancy because while target may be accepted as possible there may be a feeling that it may not succeed.

A number of factors influence people's decisions about innovations. Spence (1994) lists the most important as:

- the personal characteristics of the individual
- the nature of the innovation itself
- the cultural climate of the society
- social pressures exerted by the working environment

Research has resulted in understanding what the attributes of these factors are and how they influence the rate of adoption of an innovation. These influences are presented in the form of *generalisations* which are supported to a differing degree by field studies (Rogers (1995)). In the following we will examine the BRIEFS System in the light of these generalisations. The numbering of the generalisations in the following refers to Rogers (1995).

We will first consider the innovation-decision process, then the innovativeness of the interviewees as potential adopters of an innovation, then the characteristics of the BRIEFS System as an innovation, and finally the characteristics of the change agent (the researcher in this case).

The characteristics of the potential adopters' organisations undoubtedly also play a role in the adoption of innovations. Such characteristics include (Rogers (1995)) the degree of centralisation, complexity or the degree of high level of knowledge and expertise, the degree of formalisation, the degree of interconnectedness, organisational slack, size and system openness. In our case we do not consider these

for two reasons. We do not have data concerning these attributes and the innovation has not progressed far enough to be considered for organisation wide implementation.

10.4.3 The Innovation-Decision Process

Rogers (1995) defines the innovation-decision process, the process by which decisions about innovations tend to proceed, as comprising five stages.

1. *Knowledge* occurs when an individual (or other decision-making unit) is exposed to the innovation's existence and gains some understanding of how it functions.
2. *Persuasion* occurs when individual (or other decision-making unit) forms a favourable or unfavourable attitude toward the innovation.
3. *Decision* occurs when an individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation.
4. *Implementation* occurs when an individual (or other decision-making unit) puts an innovation into use.
5. *Confirmation* occurs when an individual (or other decision-making unit) seeks reinforcement of an innovation-decision already made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation.

The innovation-decision process is essentially an information-seeking and information-processing activity in which the individual is motivated to reduce uncertainty about the advantages or disadvantages of the innovation (Rogers (1995)). The process is also depicted in Figure 10-2.

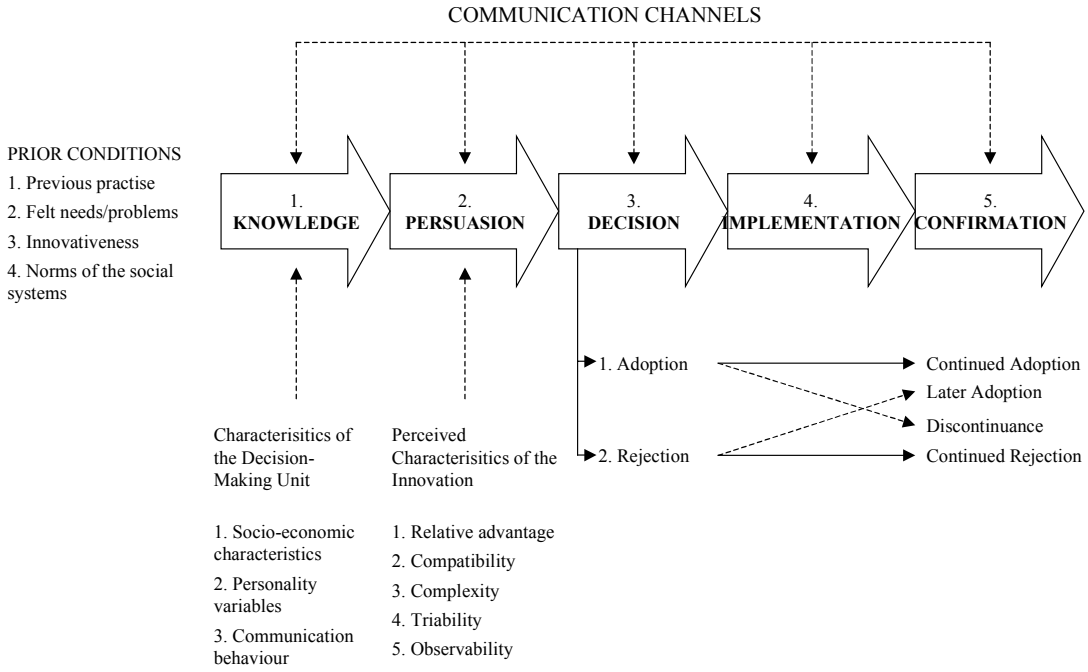

Figure 10-2 A model of stages in the innovation-decision process (Rogers (1995))

In our case the interviewees could be said to be mainly in stages one or at most in stage two although in the interview they were prematurely forced into stage three with "would you implement?" question. We will consider the first two phases in more detail in the following.

10.4.3.1 Knowledge Stage

Prior conditions influence the innovation-decision process. For instance if there is felt need or a current problem then this may cause an individual to seek knowledge about innovations. On the other hand knowledge of innovations may create needs. So this could be a chicken-and-egg problem as Rogers (1995) points out. The characteristics of an individual or a decision-making unit also determine how actively knowledge is sought. The main questions in the knowledge stage are "What is the innovation?", "How does it work?" and "Why does it work?".

In our case the managers were exposed to answers to these questions. Obviously the managers more familiar with the BRIEFS project had had the chance to develop more profound answers than those less familiar.

10.4.3.2 Persuasion Stage

At the persuasion stage the individual becomes more psychologically involved with the innovation; he or she actively seeks information about the idea. At this stage the perceived attributes of an innovation become important. Questions such as "What are the innovation's consequences?" and "What will its advantages and disadvantages be in my situation?" are asked.

In our case we cannot say that any of the managers, to our knowledge, would have clearly been in the persuasion stage regarding the adoption of BRIEFS. In the interview situation they were forced to consider and did consider the consequences and the advantages, however, as well as the subsequent stages of decision, adoption, and even confirmation.

10.4.4 Innovativeness of the Interviewees

Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system (Rogers (1995)).

Generalisation 7-1 (Rogers (1995)) states that: *Adopter distributions follow a bell-shaped curve over time and approach normality.* Adopters of innovations are categorised into five categories according to the time they are likely to adopt innovations:

1. Innovators (2.5%)
2. Early adopters (13.5%)
3. Early majority (34%)
4. Late majority (34%)
5. Laggard (16%)

Are the interviewees who believe in the BRIEFS System more innovative and the others less? This is the question we attempt to answer in the following.

Diffusion of innovation theory suggests a number of generalisations regarding variables related to innovativeness. They are grouped into the following categories (Rogers (1995)):

1. socio-economic status (9 generalisations)
2. personality variables (12 generalisations)
3. communication behaviour (10 generalisations)

We will in the following list the generalisations and assess how our interview results relate to these generalisations. There are altogether 31 generalisations, numbered from 7-2 to 7-32. We do not have measured data for most of the personality variables and some of the communication variables. Nevertheless the corresponding generalisations are listed for completeness but no explanations are offered.

The generalisations refer to *earlier adopters* and *later adopters*. Based on our interview data we hypothesise our "believers" to be earlier adopters and our "doubters" to be later adopters. We do not attempt to further classify the interviewees according to the five ideal types, as we have no data to do this.

We first present our assessment regarding the individual innovativeness attributes in the three categories and then follow this up with an overall summary.

10.4.4.1 Socio-economic Status

There are nine generalisations regarding variables related to socio-economic status. It has been possible to evaluate many of these based on our interview data.

Generalisation 7-2: *Earlier adopters are not different from later adopters in age.*
This generalisation was supported based on our interview data as was shown in the discussion concerning Table 9-23 "Overall attitude vs. Age group" in Section 9.7.3. Age did not make a difference.

Generalisation 7-3: *Earlier adopters have more years of education than later adopters have.*
Our results somewhat support this generalisation in that of the eight PhDs in the sample seven were classified as "believers" whereas of the rest 18 seven were classified as "believers" vs. 11 as "doubters" as Table 10-1 shows. The probability of the χ^2 statistic is 0.022 signifying an almost significant dependency between the variables.

Table 10-1 Higher education and belief in the BRIEFS System. $p(\chi^2) = 0.022$

	"Believer"	"Doubter"	Total
No PhD	7	11	**18**
PhD	7	1	**8**
Total	**14**	**12**	**26**

Generalisation 7-4: *Earlier adopters are more likely to be literate than are later adopters.*

This generalisation cannot directly be assessed based on our data. In our mind the group interviewed is in general highly literate.

Generalisation 7-5: *Earlier adopters have higher social status than later adopters.*

We did not collect direct data about the social status of the interviewees. We could indirectly say that having top management experience implies higher social status. However, this interpretation does not offer support or rejection of the generalisation. It is also conceivable that in fact there are no significant differences in the social status of the people in the group interviewed such that it would influence their innovativeness.

Generalisation 7-6: *Earlier adopters have a greater degree of upward social mobility than late adopters.*

We did not make direct observations about the upward mobility of the interviewees but categorised them afterwards somewhat subjectively to two classes: the upward mobile class and the neutral or not upward mobile class. Although the author's personal experience leans towards supporting this generalisation subsequent analysis of our data based on the binomial classification did not offer support or rejection of the generalisation. In fact Rogers (1995) also points out that there is no definitive support for this generalisation.

Generalisation 7-7: *Earlier adopters have larger sized units*.

This generalisation is supported by our data if company size is taken as the size of unit as Table 10-2 shows. The probability of the χ^2 statistic is 0.018 bordering on significant support.

Table 10-2 Company size and belief in the BRIEFS System. $p(\chi^2) = 0.018$.

Company size	"Believer"	"Doubter"	Total
Large	10	3	**13**
Small, medium	4	9	**13**
Total	**14**	**12**	**26**

Generalisation 7-8: *Earlier adopters are more likely to have a commercial (rather than subsistence) economic orientation than are later adopters.*

This generalisation is not relevant in our context, as all interviewees are representatives of commercial businesses.

Generalisation 7-9: *Earlier adopters have a more favourable attitude towards credit (borrowing money) than later adopters.*

Data concerning this generalisation was not acquired.

Generalisation 7-10: *Earlier adopters have more specialised operations than later adopters.*

Our data shows some support for this generalisation if we interpret having top management experience implying participation in a less specialised operation and no top management experience implying participation in a more specialised operation. As Table 10-3 shows there are relatively more "believers" in the no top management category. The dependency is not, however, supported by probability of the χ^2 statistic of 0.225

Table 10-3 Top management experience versus belief in the BRIEFS System. $p(\chi^2) = 0.225$

Top management experience	"Believer"	"Doubter"	Total
Yes	6	8	**14**
No	8	4	**12**
Total	**14**	**12**	**26**

10.4.4.2 Personality Variables

Rogers (1995) lists altogether 12 variables and consequent generalisations related to personality. For most of these we did not collect systematic and reliable data. Rogers (1995) points out that several of these generalisations in fact lack definitive empirical evidence. We would also like to point out that many of the variables could considered to be interlinked to a varying degree. We list the generalisations here for completeness but offer few comments. In future studies measuring these variables could through more light in the results of studies like this one.

Generalisation 7-11: *Earlier adopters have greater empathy than later adopters.*
Generalisation 7-12: *Earlier adopters may be less dogmatic than later adopters.*
Generalisation 7-13: *Earlier adopters have a greater ability to deal with abstractions rather than late adopters.*

Generalisation 7-14: *Earlier adopters have greater rationality than later adopters.*
We would consider all interviewees rather rational.

Generalisation 7-15: *Earlier adopters have greater intelligence than later adopters.*
We did not perform intelligence tests. The fact that the PhDs interviewed were with the exception of one in the "believers" group may be considered to offer some support to this generalisation.

Generalisation 7-16: *Earlier adopters have a more favourable attitude toward change than later adopters.*
The group as a whole can be said to acknowledge change as an inevitable part of contemporary life.

Generalisation 7-17: *Earlier adopters are more able to cope with uncertainty and risk than later adopters.*

Generalisation 7-18: *Earlier adopters have a more favourable attitude toward education than later adopters.*

Although we did not collect specific data we note that all interviewees have academic degrees and work in knowledge intensive companies. It is therefore conceivable that their attitude for education is rather uniform. Again, the group of PhDs could be used as weak supporting evidence.

Generalisation 7-19: *Earlier adopters have a more favourable attitude toward science than later adopters.*

If we look at the answers concerning the Mintzberg 4 folklore theme about management becoming a science and a profession then we find some support for this generalisation as Table 10-4 shows. The "believers" are slightly more in agreement with the theme. This result cannot be interpreted to reflect the interviewees' attitude toward all science, however. The probability of the χ^2 statistic is 0.099.

Table 10-4 Attitude towards Mintzberg 4 folklore theme vs. belief in BRIEFS System. $p(\chi^2) = 0.099$

Attitude towards Mintzberg 4 folklore	**"Believer"**	**"Doubter"**	**Total**
Agrees	5	1	**6**
Disagrees or is reserved	9	11	**20**
Total	**14**	**12**	**26**

Generalisation 7-20: *Earlier adopters are less fatalistic than later adopters.*

Generalisation 7-21: *Earlier adopters have higher levels of achievement motivation than later adopters.*

Generalisation 7-22: *Earlier adopters have higher aspirations (for education, occupations, and so on) than later adopters.*

10.4.4.3 Communication Behaviour

There are ten variables and consequent generalisations related to communication behaviour. It is possible to classify the interviewees on some of these variables based on our interview data. The discussions held in particular around the Mintzberg themes and the favourite sources of information enabled this. The classification is somewhat subjective, however.

Generalisation 7-23: *Earlier adopters have more social participation than later adopters.*

Many interviewees did refer to the importance of social participation, people contacts. However, we did not collect systematic data about the actuality with regard to this variable.

Generalisation 7-24: *Earlier adopters are more highly interconnected in the social system than later adopters.*

Generalisation 7-25: *Earlier adopters are more cosmopolite than later adopters.*

A person was classified as being more or less cosmopolite according to whether he or she is part of an international organisation or not. On first sight our data seems to offer some weak support for this generalisation as Table 10-5 shows. The probability of the χ^2 statistic is 0.734 and does not support this statement. The table primarily shows that the group interviewed is rather cosmopolite in general.

Table 10-5 Cosmopoliteness vs. belief in the BRIEFS System. $p(\chi^2) = 0.734$.

Cosmopoliteness	"Believer"	"Doubter"	Total
Higher	11	8	**19**
Lower	3	4	**7**
Total	**14**	**12**	**26**

Generalisation 7-26: *Earlier adopters have more agent contact than later adopters.*

Generalisation 7-27: *Earlier adopters have greater exposure to mass media communication channels than later adopters.*

We suspect the group is rather uniform in this respect.

Generalisation 7-28: *Earlier adopters have greater exposure to interpersonal communication channels than later adopters.*
Generalisation 7-29: *Earlier adopters seek information about innovations more actively than later adopters.*
Generalisation 7-30: *Earlier adopters have greater knowledge of innovations than later adopters.*
If we equate greater knowledge with familiarity with the BRIEFS System then this generalisation is supported.as was shown in Table 9-17.

Generalisation 7-31: *Earlier adopters have a higher degree of opinion leadership than late adopters.*
Generalisation 7-32: *Earlier adopters are more likely to belong to highly interconnected systems than are later adopters.*

10.4.4.4 Summary of the Innovativeness of the Interviewees

Table 10-6 in the following summarises the results of the innovativeness analysis. The assessment states whether we have found some support for the generalisation. We have dropped the generalisations for which we have no data.

Our results show that several of the generalisations are supported by our data. Especially the socio-economic factors are supported. Only one of the generalisations (7-25 Cosmopoliteness) was clearly not supported by our data. In several respects, e.g. rationality, the group interviewed can be considered rather uniform. In summary the group of "believers" can be considered have more innovativeness than the group of "doubters" which was our hypotheses.

Table 10-6 Summary of the innovativeness attributes

Socio-economic characteristics	
Generalisation	**Assessment**
Generalisation 7-2: *Earlier adopters are not different from later adopters in age.*	Supported
Generalisation 7-3: *Earlier adopters have more years of education than later adopters have*	Supported
Generalisation 7-4: *Earlier adopters are more likely to be literate than are later adopters.*	No data, weak indirect support
Generalisation 7-5: *Earlier adopters have higher social status than later adopters.*	Not supported, not refuted, uniform group
Generalisation 7-6: *Earlier adopters have a greater degree of upward social mobility than late adopters.*	Not supported, not refuted
Generalisation 7-7: *Earlier adopters have larger sized units*.	Supported
Generalisation 7-8: *Earlier adopters are more likely to have a commercial (rather than a subsistence) economic orientation than are later adopters.*	Not relevant, uniform group
Generalisation 7-10: *Earlier adopters have more specialised operations than later adopters.*	Supported

Personality characteristics	
Generalisation	**Assessment**
Generalisation 7-14: *Earlier adopters have greater rationality than late adopters.*	Uniform group
Generalisation 7-15: *Earlier adopters have greater intelligence than later adopters.*	Weak indirect support
Generalisation 7-18: *Earlier adopters have a more favourable attitude toward education than later adopters.*	Weak indirect support
Generalisation 7-19: *Earlier adopters have a more favourable attitude toward science than later adopters.*	Weak indirect support

Communication Behaviour	
Generalisation	**Assessment**
Generalisation 7-25: *Earlier adopters are more cosmopolite than later adopters.*	Not supported
Generalisation 7-30: *Earlier adopters have greater knowledge of innovations than later adopters.*	Supported

10.4.5 Innovation Attributes of BRIEFS

What is the BRIEFS System like as an innovation and how might this affect its possibilities of adoption in companies? Rogers (1995) lists five major attributes of innovation that affect its rate of adoption and suggests generalisations as to their direction of influence:

1. *Relative advantage* which is the degree to which an innovation is perceived as being better (economically, socially, …) than the idea it supersedes.

   Generalisation 6-1: *The relative advantage of an innovation, as perceived by members of a social system, is positively related to its rate of adoption*.
2. *Compatibility which* is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters.

   Generalisation 6-2: *The compatibility of an innovation, as perceived by members of a social system, is positively related to its rate of adoption*.
3. *Complexity which* is the degree to which an innovation is perceived as relatively difficult to understand and use.

   Generalisation 6-3: *The complexity of an innovation, as perceived by members of a social system, is negatively related to its rate of adoption.*
4. *Triability which* is the degree to which an innovation may be experimented with on a limited basis.

   Generalisation 6-4: *The triability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.*
5. *Observability which* is the degree to which the results of an innovation are visible to others.

   Generalisation 6-5: *The triability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.*

Rogers (1995) notes that the attributes are somewhat empirically interrelated, but claims that they are conceptually distinct. We note e.g. that complexity is likely to impact triability and observability.

Let us now consider the BRIEFS System and these attributes. We have addressed each attribute at a time and have examined the interview data for statements related to the attribute.

10.4.5.1 Relative advantage

The interview data shows that a BRIEFS like system would have a relative advantage, mostly an economically oriented, over existing systems and schemes. With one exception both the "believers" and the "doubters" suggested advantages that concerned e.g. the productivity and the improved quality of the results of the strategy process or some part of it as discussed in Section 9.8.4.1.

10.4.5.2 Compatibility

An innovation can be compatible or incompatible (1) with sociocultural values and beliefs, (2) with previously introduced ideas, or (3) with client needs for innovations. We will address these sub-dimensions of compatibility.

10.4.5.2.1 Compatibility with Values and Beliefs

Some doubts of the "doubters" could be considered related to generally held sociocultural values and beliefs. These concerned doubts about the intelligence computer systems could ever acquire and in particular beliefs about the decisive role humans should always play.

10.4.5.2.2 Compatibility with Previously Introduced Ideas

Compatibility of an innovation with a preceding idea can either speed up or retard its implementation (Rogers (1995)). In the case of BRIEFS the preceding ideas are deterministic strategic planning schemes and the management information systems (MIS) of the 1970's and 1980's. Both are infamous today and were referred to by some of the doubting interviewees.

The current emphasis on the Internet and the opportunities it is envisioned to offer can be considered a preceding idea that is positively compatible although this could not be

directly discerned from the interview data. Related to this is the current emergence of systems supporting the Business Intelligence (BI) function in companies.

10.4.5.2.3 Compatibility with Client Needs

There exists some compatibility with the ideas represented by the BRIEFS System and the needs of the potential clients. The interview data provides evidence that there is a need to gain better control over the increasing amounts of data and a need to be able to find the relevant part of this data. Also a need to make better use of the relevant data was expressed. This was in particular obvious from the responses to the Keijola 1 theme as shown in Section 9.6.1.5[21]. Many needs were also expressed as requirements for a BRIEFS like system or as prerequisites the system should meet.

On the other hand clients may not recognise that they have needs for an innovation until they are aware of the new idea or of its consequences (Rogers (1995)). This was also evident in the interview data in that no one expressed anything to the extent that "I have been looking for something like this".

10.4.5.3 Complexity

On the complexity - simplicity scale the BRIEFS System must be classified as complex. Its use currently needs technical expertise and even preferably an appreciation of linguistics. It is also necessary to understand its inner workings in order to be able to fully evaluate its results.

10.4.5.4 Triability

Due to the complexity of the system and its research nature the triability of the BRIEFS System by potential users must be considered low to medium. We have tried to alleviate this by making it possible to access the applications over the Internet but currently this is limited to the main demos and selected tools.

10.4.5.5 Observability

Also the observability of the results is on the lower end of a scale. It was evident to the researcher from the interviews that the system and its possible uses are not easy to describe or to communicate. Desire for higher observability was also evident from

[21] *Folklore:* Companies are flooded with (strategic) information. They wish they could analyse it better.

interviews in that more evidence was desired by the managers to convince them about the trustworthiness of the system and to help understand the uses it could be put to.

10.4.5.6 Summary of the BRIEFS System' s Innovation Attributes

Table 10-7 presents a summary of the innovation-related factors of the BRIEFS System. For each attribute we present a summary evaluation and a somewhat subjective assessment of its influence. The influence is estimated as to its direction (Positive, Negative) and its relative magnitude (High, Medium, or Low)

Table 10-7 Evaluation of the BRIEFS System based on the attributes of innovation and their influence (direction and magnitude)

Attribute	Evaluation	Influence
Relative advantage	Many advantages	Positive, High
Compatibility with Values and Beliefs	Issue with intellectual potential of computer systems	Negative, Low
Compatibility with previously introduced ideas	For: Internet, BI Against: MIS	Positive, Low
Compatibility with needs	Expressed needs exist Probable latent needs	Positive, Medium
Complexity	Complex	Negative, High
Triability	Difficult	Negative, Medium
Observability	Not easy	Negative, High

The evaluation above shows that the innovation-related attributes of the BRIEFS-system are not very favourable. Examining Table 10-7 and considering how the evaluation of the BRIEFS System can be improved we make the following notes for future work:

1. Work could be done to identify more relative advantages based on existing ideas. System could be improved to realise more relative advantages.
2. Compatibility with values and beliefs can be expected to improve as the abilities of computer systems in general improve.
3. Compatibility with previously introduced ideas will also improve as better systems are realised and the Semantic Web is being implemented.
4. Clients' latent needs should be uncovered.

5. It is probable that the system's complexity cannot be reduced. Its user-friendliness can, however.
6. The packaging of the system can be improved for better triability.
7. Observability and triability can be improved by introducing better demonstrations, customer cases plus training and presentation material.

The generalisations of the innovation diffusion theory seem to offer a plausible evaluation framework. In the case of the BRIEFS System they lead to an evaluation that is intuitively and in the light of the interview data acceptable.

10.4.6 The Change Agent

A *change agent* is an individual who influences clients' innovation decisions in a direction deemed desirable by a change agency (Rogers (1995)). In our case we can say that the research institutions involved in the BRIEFS project represent a change agency. They wish client organisations to adopt their research result, the BRIEFS System. The researcher, being the manager of the BRIEFS project, could be considered a change agent.

Success of a change agent is determined according to a number of factors (Rogers (1995)). A number of generalisations have been developed as result of innovation diffusion research. Although we cannot claim adoption of the BRIEFS System by any organisation we will consider the BRIEFS System and reflect on these generalisations in the following. We consider this to be useful understanding for future research.

Generalisation 9-1: *Change agent success is positively related to the extent of change agent effort in contacting clients*.
Although we have no measured results we did notice that it was a good idea to hold project Steering Group meetings and meet with individual clients more frequently than infrequently.

Generalisation 9-2: *Change agent success is positively related to a client orientation, rather than to a change agency orientation.*
Due to the business planning background of the researcher we can assume at least some understanding of clients' needs. We could assume this attribute to favour our change agent.

Generalisation 9-3: *Change agent success is positively related to the degree to which the diffusion program is compatible with clients' needs.*
The clients could not be perceived to have acute, pressing needs. Therefore this attribute would not favour our change agent.

Generalisation 9-4: *Change agent success is positively related to empathy with clients.*
This attribute is related to the homophily discussion in the following. We assume it to favour our change agent.

Generalisations 9-5 to 9-8 deal with homophily and change agent contact. Homophily is the degree to which pairs of individuals who interact are similar in certain attributes, such as social status, education and cosmopoliteness. Heterophily is the degree in which they differ. In our case we can assume homophily rather than heterophily by design. Our contacts were with people whose jobs involved business planning and who had, at least initially, a favourable attitude toward the project. These people tended to be like-minded.

Generalisation 9-9: *Change agent success is positively related to homophily with clients.*
There were no perceived heterophily situations between the change agent and the managers interviewed. As we have no grounds to measure the degree of homophily we cannot make any conclusions as to the validity of this generalisation. We assume it holds and favours our change agent.

Generalisation 9-10: *Change agent success is positively related to credibility in clients' eyes.* There are two kinds of credibility. *Competence credibility* is the degree to which a communications source or channel is perceived as knowledgeable or

expert. *Safety credibility* is the degree to which a communications source or channel is perceived as trustworthy.

In our case we did not attempt to measure credibility. However, we assume some credibility exists because funding sources have been found for the project.

Generalisation 9-11: *Change agent success is positively related to the extent that he or she works through opinion leaders.*
The group of managers interviewed can be regarded as key influencers in the domain of business panning in their organisations. This attribute can thus be considered to be in the favour of our change agent.

Generalisation 9-12: *Change agent success in securing the adoption of an innovation by clients is positively related to increasing client ability to evaluate innovations.*
We have weak support for this generalisation in that our data shows that more familiarity of the BRIEFS System increases belief in it as Table 9-17 shows.

Table 10-8 in the following summarises the results of the change agent analysis. The somewhat subjective assessment states (1) whether we have found support for the generalisation and (2) whether the attribute favours our change agent.

Table 10-8 Summary of change agent analysis

Generalisation	**Assessment**
Generalisation 9-1: *Change agent success is positively related to the extent of change agent effort in contacting clients*.	Weak support. Favourable
Generalisation 9-2: *Change agent success is positively related to a client orientation, rather than to a change agency orientation.*	No data. Favourable
Generalisation 9-3: *Change agent success is positively related to the degree to which the diffusion program is compatible with clients' needs.*	No data. Unfavourable
Generalisation 9-4: *Change agent success is positively related to empathy with clients.*	No data. Favourable
Generalisations 9-5 to 9-8: *Homophily and agent contacts*	Weak support.

Generalisation	Assessment
Generalisation 9-9: *Change agent success is positively related to homophily with clients.*	No data. Favourable
Generalisation 9-10: *Change agent success is positively related to credibility in clients' eyes.*	No data. Favourable
Generalisation 9-11: *Change agent success is positively related to the extent that he or she works through opinion leaders*	No data. Favourable
Generalisation 9-12: *Change agent success in securing the adoption of an innovation by clients is positively related to increasing client ability to evaluate innovations.*	Weak support. Favourable

In our case of a single change agent we could not conceive of attributes of the agent that would refute the generalisations.

10.4.7 Summary of Innovation Diffusion

We have shown that our interview data in general does not refute the generalisations of the innovation diffusion theory. In many cases it supports them, at least weakly. Despite of the fact that we do not have comprehensive data to examine all the generalisations it is thus plausible to interpret our data by making use of the innovation-diffusion theory. The experience and the intuition of the author is in agreement with this, too.

In the light of the innovation diffusion theory our construct is classified as one for which diffusion is likely to be slow. Our "believers" are more innovative than our "doubters". Conditions for our change agent can be considered favourable.

We make the following final critical notes

1. The results also show that the group interviewed may be rather uniform in many respects. Therefore many generalisations were neither supported nor refuted. We suspect that decision-makers with a responsibility or interest in business planning are in general rather uniform. The job leads them to this. It is not easy to see how the group could have been enriched with managers with very differing views.

2. The interviewees were mainly in the knowledge stage in the innovation-decision process. Therefore there answers, whilst presumed honest, were given in a no-risk, no-consequence situation. Had the interviewees been in the decision stage the answers could have been different.

10.5 Summary

In this chapter we have considered and evaluated the BRIEFS System from three perspectives: quality of information, decision support (intelligence density) and innovation diffusion. Whilst we are still in early stages of emerging concepts these evaluations have helped to consider some potential benefits of BRIEFS as well as its drawbacks and aspects needing further work. We have not only been able to address particular, often technically oriented, functionality of the system but also the attributes of the system that might advance, or hinder, its acceptability and adoptability in companies.

11 Conclusions

11.1 Was What Was Set Out to Do Done?

Within the scope of our research, computer support for strategy work and the potential role computer processing of natural language format text in it, we set seven questions to be answered in this thesis:

1. What kind of computer based tools exist to support strategy work?
2. Are the tools used?
3. Is there a need for the tools?
4. What are the requirements for the tools?
5. What could be the solutions for the tools?
6. Could partial and useful solutions be built?
7. What does management think about the partial solutions built and why?

We claim to have given some, but by no means all, considered answers to these questions according to our original plan, shown again in Table 11-1.

Table 11-1 Chapters of this thesis and their relation to the research questions

Chapter	Research Question: 1. What kind of tools exist?	2. Are they used?	3. Is there a need?	4. What are the requirements	5. What could be the solutions?	6. Could useful solutions be built?	7. What feedback does management give and why?
3. Practical Relevance of This Study	Y	Y	Y				
4. A Description of Strategy…				Y			
5. A Review of the Tools for Strategy	Y				Y		
6. Theoretical Considerations					Y		
7. The BRIEFS System					Y	Y	
8. The Experiments						Y	
9. Management Feedback	Y	Y	Y	Y			Y
10. Evaluations				Y		Y	Y
11. Conclusions	Y	Y	Y	Y	Y	Y	Y

We identified nine key requirements for a strategy support system.

1. Flexibility for accommodating changes in the environment and in the attention of business
2. Flexibility for changing strategic paradigms, to allow for deployment of new concepts in strategy
3. Flexibility in bringing a rich and open set of data into a decision making situation
4. Tolerate masses of irrelevant data and arrive at the best capta, set of relevant data
5. Tolerate incomplete and inaccurate data
6. Tolerate and be flexible about the uncertainty of future outcomes, allow for the possibility of dynamic multiple futures
7. Tolerate and be flexible about differences in inquiring organisations
8. Accumulate timely and comprehensive information and manage dynamic knowledge
9. Process and synthesise multiple views in an unbiased way.

Have we been able to meet the requirements? We claim to have described, in Chapter 6, some theoretical constructs that address these requirements. We claim to have implemented a partial solution meeting some of these requirements as described in Chapter 7.

We summarised the general issue as *support for making sense of huge, complex and dynamic data for complex and dynamic decision making situations.* Have we made any progress? We claim to have made some progress with regard to this issue by showing some practical examples as described in Chapter 8. We tested their relevance through interviews of managers as described in Chapter 9. We further evaluated our results as described in Chapter 10.

The title of this thesis is "On Smart and Natural Language Technology Support of Strategy Work". We have not extensively addressed the "smart" attribute of the title. We note, however, that "smart" is imbedded in many of our ideas and it is one of the long-term aims we are targeting. The knowledge base and complex queries are at the forefront on the road.

11.2 What Was Found Out?

We started our research with the notion that to support strategy work a model of a business in its environment is needed and the model needs be fed with appropriate data (capta). After some theoretical surveying and considerations we decided to concentrate in particular to explore how processing of textual data could serve there. We have subsequently found that not only can analysis of text be of service as input to models and even modelling itself, but also it goes further. The accumulation of data based on textual analysis can in fact lead to formation of actual models in the sense of revealing patterns, such as trends in the public presence of an entity or phenomenon or structures of industries.

Additionally we found some likely characteristics of the set of managers that is likely to consider favourably systems like BRIEFS as described in Chapters 9 and 10.

To summarise we have found that

1. processing of text in a computer can be exploited to help meet the requirements of managers for strategy support systems as was shown in Chapters 8 and 9
2. A BRIEFS like system has capabilities that are desired by practising managers as was shown in Chapter 9.
3. such innovative systems are complex and do not diffuse easily as was discussed and shown in Chapters 8 and 10.
4. managers become more favourable to such systems once they have been exposed in practise to the possibilities of such systems as was shown in Chapter 9.
5. favourable managers are more innovative than others as was shown in Chapter 10.

11.3 Management Implications

We have established through the interviews described in Chapter 9 that our line of research has credibility in the eyes of strategic managers. We now claim that an enlightened business should and could start to pay heed to the long-term prospects arising from the integration of language processing, the Internet and knowledge management in support of strategic planning. Advanced commercial products for competitive intelligence, such as the ClearResearch suite described in Section 5.5.2, are emerging to the markets. Adopting them is the next task of management but they should also look beyond. Preparations for reaping the best benefits enabled by the new technologies addressed in this thesis will require a long-term effort. In the author's view the earlier the work is started the more significant will be the competitive advantages.

What then are the implications of our findings to management? If we rephrase this question to "how could management realise the benefits of BRIEFS like systems which the interviewees saw in the interview sessions?" then we have a base to answer the question by resorting to the interview data. Especially the answers to the "how would you use?" and "would it make your work different?" questions provide clues, but clues can be found in answers to the other questions, too. Let us start by recalling what uses were indicated, and what benefits were expected.

Potential applications that were identified included:

- Strategy work in general
- Competitive analysis, competitor surveillance
- Business analysis, Industry analysis
- Brand tracking
- Industry induction/training

The potential users in an organisation included

- the top team (the Board room)
- business/competitive intelligence units
- other functions such as marketing and communications
- training or induction of managers to the industry

The following potential benefits were identified

1. *improved productivity:*

- Save time and effort, speed up processes
- Act as a pre-reader, fast reader for a person
- Ease pick-up of facts, sorting and further analysis
- Enable exercises that are hard to do by hand
- Enable more facts to be processed

2. *improved quality:*

- Knowing more, with more links to evidence
- New depth, better concept schemes
- Save information from getting drowned, improved control
- Give more time for analysis and reflection
- Find unusual, new connections
- Trigger questions and creative thinking, start debates
- Support innovation and intuition
- Support early warning

Let us say there are two principal ways of driving the strategic management process: top down and bottom up. Top down in our context amounts to hypotheses testing and bottom up to induction. Top down means understanding the reasoning and intentions

in the scenarios, strategies and plans of the business. This leads to the specification of hypotheses and how they should be tested which in turn defines what sort of information is needed to test them. A type of scheme described originally in Figure 6-6 and presented in a modified form here in Figure 11-1 results. An alternative scenario could also be regarded a plan.

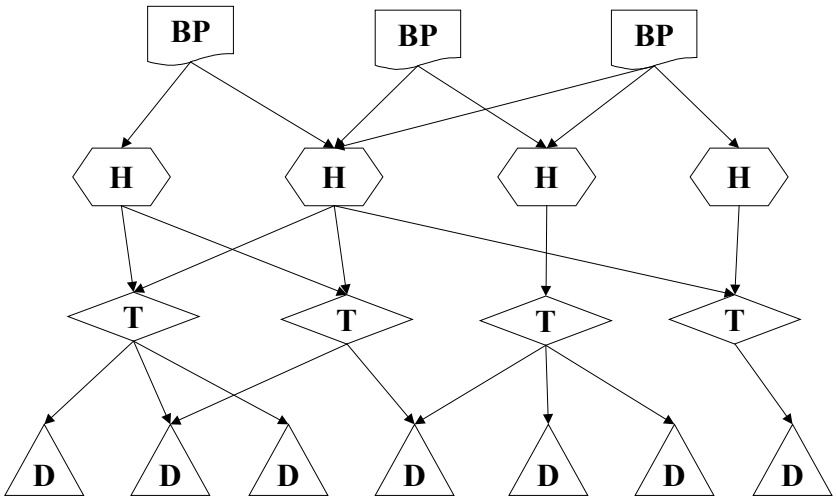

Figure 11-1 The Hypotheses Testing Scheme (BP = Business Plan or scenario, H = Hypothesis, T = Test, D = Extracted Data)

This scheme could guide both the development of the business planning, intelligence, and information systems organisations as well as the creation of supporting systems and databases. Many of the expected productivity and some of the quality benefits could be realised through this scheme.

The hypotheses testing arrangement described above has a deterministic flavour to it in the sense that whilst the individual hypotheses can be challenged in an inductive, bottom up way, its driving logic flows from top to bottom. What we need in addition is a way to challenge everything and exploit available data in an unrestricted way. We need to seek fresh views and be alert for emerging threats and new opportunities. We need seeds for alternative scenarios. For this an inductively driven approach is called for. In the inductive approach the driving logical flow goes in direction opposite to hypotheses testing. Data may give rise to new hypotheses which in turn could be linked to existing plans or could be collected together to become a basis of a new plan as shown in Figure 11-2. Some of the productivity and many of the expected

qualitative benefits, especially the innovation related, could possibly be realised through this scheme.

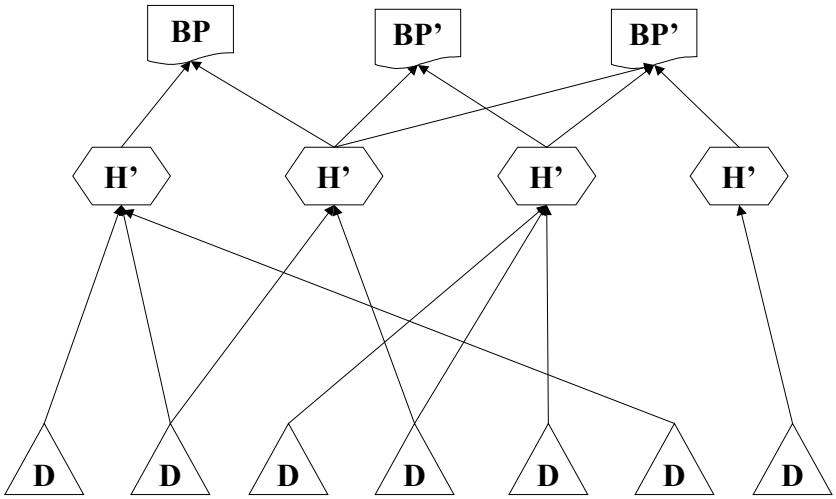

Figure 11-2 The Inductive Scheme (BP = Existing Business Plan or scenario, BP' = New Business Plan or scenario, H' = Emerging, New Hypothesis, D = Extracted Data).

The inductive, knowledge discovery, schemes could be running at all times thus, for instance, making use of any spare computer capacity that might exist in a corporation.

A number of statements were made relating to the conditions for the conceived implementation/adoption of a BRIEFS like system:

- Focused start
- Results needed soon
- Assistants are needed, specialist support needed.
- Find interested sponsors inside company. Need pull from the organisation.
- Core tem must agree this is a good idea. Need an eager champion in the company. Can be tough in the beginning (i.e. needs management backing).

These statements reflect an understanding of the challenging adoption attributes of a BRIEFS like system as was discussed in Section 10.4. The managerial resistance to smart planning support systems will not be a hindrance if addressed in the right way to the right audience with the backing of the management.

To build a basis for the future exploitation of advanced knowledge technologies in support of strategy work the author suggests the following necessary but not necessarily sufficient sequence of activities to be considered by strategic managers:

1. Secure a rich set of sources of text about the business and its environment
2. Create an environment for testing the emerging language and knowledge technologies
3. Build for a rich set of schemes to annotate text and extract data. These schemes, to start with, could be derived from existing business documentation.
4. Conceive of a structure for a knowledge base to store extracted data
5. Experiment with the creation of one, narrow scope, domain of knowledge
6. Experiment with harmonisation of knowledge items
7. Experiment with hypotheses testing
8. Experiment with creation of multiple domains of knowledge and their dependencies
9. Experiment with induction
10. Build an understanding on how to deal with the dynamics and fuzziness of knowledge
11. Consider organisational consequences.

11.4 Contribution of This Research

We have drawn influences from many theoretical fields of study in our research as discussed in Chapters 4 and 5. We have pulled together these to introduce some theoretical constructs for supporting strategy work as described in Chapter 6 and Chapter 7.

We claim that the original contributions of our research are

1. a rather holistic treatment of the refinement of information chain from textual documents to knowledge discovery to serve strategy work,
2. the introduction of a framework for a future business planning support system,
3. putting some aspects of the framework together in such a way as to make them visible to practising managers,
4. getting practising managers reactions to the concepts through showing them one specific example called BRIEFS and thereby
5. establishing managerial requirements for future strategy support system development and
6. gaining an understanding of managers' responses by examining how they react to innovations concerning a tool for strategic management

7. outlining of a management action plan to exploit future developments in language and knowledge technology in support of strategy work

11.5 Relevance of This Research

We established early relevance of our research by a feasibility study (Sakkinen (1997)). The relevance of our research was further confirmed by the management interviews. Especially several of the more enlightened managers, in the author's view, considered our research important.

11.6 Validity and Reliability of This Research

Are our results valid? We have addressed the validity of our results throughout this thesis. There is not much new to say in that respect. We therefore concentrate on the reliability aspects of our research. How reliable is our research? Are the results stable? These are the main questions we address in the following.

Would we change our basic architectural considerations because they were unsound? We have not surfaced any reason to change them. They are ambitious, but we claim they do provide a long-term framework. Would we build a different system today? No doubt, we would build a different system and we could improve the quality of its output. We would exploit advances in technology and pay heed to what we have learnt. Would we solicit and process managers' feedback differently? We have not encountered reasons to change the design of the interviews. The design was solid in that it could be followed through the whole set of interviews. We could in the future incorporate ideas from the three frameworks which we used for evaluation and discussed in Chapter 10. This would lead to more time required in the interviews which might be difficult to get. Were we to redo the interviews today we would get somewhat different answers because learning has taken place. The answers could be interpreted using the same framework but the interpretations would not be exactly same. The managers have learnt and the interviewer has learnt. However, there is no reason not to take managers' responses seriously and not to believe in what we have found. It is necessary to suspect, though, that were the managers in a genuine decision making situation their responses could have been different.

11.7 Further Research

Have we done everything we always wanted to do within the scope of our research? As the reader has no doubt observed our research has left room for more complete answers to our research questions and has also fired new questions. In the field of management support there is no end of lines of interesting research continuums. We are dealing with a wide notion that ranges from augmenting the intellectual performance of human beings to the control of bits in the computer. We pose four possible research questions, one business managerial, one IS managerial, one regarding the functionality of the system and one regarding further experimentation with BRIEFS:

11.7.1 The Business Managerial Case.

Several of the managers interviewed expressed the need for more conclusive and practical evidence of the benefits of a BRIEFS like system. They wanted to be convinced that the system could have been of assistance e.g. in a past case. The research question could be posed as "How to create a more genuine strategic decision making situation regarding complex information systems for the practising managers? Is trial implementation the only possibility? Could we make use of, for instance, some well-researched company cases, such as those from the Harvard Business School?"

11.7.2 The IS Managerial Case.

In the author's mind two important, and in the long run critical, issues regarding creating and managing knowledge have arisen during the course of the research. One relates to the dynamics of knowledge and the other to the re-use, adaptation and synchronisation of knowledge in a multi-domain situation. These issues are not unrelated and there are many detailed questions within these issues. The contents and concepts of single domains as well as the portfolios of domains have dynamic life cycles within which entities not only get born and die but can also change form. To start with we could frame the research question as "How to implement dynamism into the BRIEFS KnowledgeBase". Obviously this case is more than managerial, it is of considerable technical challenge, too.

11.7.3 The Functionality Case.

Many of the managers interviewed stressed the importance of taking a forward look. They wanted answers to questions such as "should we be alerted about this…?" "what is their next move…?" "should we go into this…?" The research question could be phrased as "How to build evaluation and forecasting mechanisms into the BRIEFS System? How to make it a smart system of foresight for a strategic manager?

11.7.4 Further Experimentation Case

We have not in all respects verified all the theory behind BRIEFS with practical experiments. Most notably we could more extensively and consequentially explore how one could and should in practise start with a Brief, then develop hypotheses, and then gather, accumulate and exploit data to create knowledge to support decision making with regard to the hypotheses. This case could also be combined with the business managerial case.

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References

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Commercial Products

Product	Company	Website
Active Worlds	Circle of Fire	www.activeworlds.com
Atlas/ti	Scientific Software Development	www.atlasti.de
BizPlanBuilder Interactive	Jian Corporation	www.jianusa.com/prod/bpifrm.html
Business Foundation	Planet Corporation	www.planet-corp.com
Business Insight	Business Resource Software	www.brs-inc.com
Business Plan Pro	Palo Alto Software	www.pasware.com
Business Planner	NetbPlan	www.users.bigpond.com/NETBPLAN/Index.HTML
Business Planning Tool	Strategic Management Group	www.smginc.com/library/jobtools/business.htm
Business Policy Game	Prentice Hall	http://www.eskimo.com/~fritzsch/game/bpg.html
Business Strategy Game	McGraw Hill	http://www.mhhe.com/business/management/thompson_elearning/bsg.mhtml
Capstone	Management Simulations Inc.	http://www.capsim.com/
Celcom 21	Business Visuals Inc.	http://www.pvisuals.com/bsg/cellular.html
ClearResearch Suite	ClearForest	www.clearforest.com
Creative Planner	Creative Planning Centre	www.cpc.com.au
Decision Explorer	Banxia	www.banxia.com
Global Business Game	SouthWestern College Publishing	http://www.swcollege.com/management/gbg/gbg.html
GroupSystems for Windows	Ventana	www.ventana.com

Product	Company	Website
InfoGraphics	Trivergence	www.trivergence.com
Inspiration	Inspiration	www.inspiration.com
Nud*ist	QSR	www.qsr.com.au
PathMaker	Skymark	www.skymark.com
PCPack	Integrated Systems Limited	www.isl.co.uk
Planning Pro Series	Enterprise Support Systems	www.ess-advisors.com
Policy Maker	Polimap	www.polimap.com
Portfolio Plus	Strategic Dynamics	www.strategic-dynamics.com
STRAD	Stradspan	www.btinternet.com/~stradspan
Strategy Round Table	Gryphon Systems	www.gryphonsystems.com
TextPack V		www.zuma-mannheim.de
Trellix	Trellix Corporation	www.trellix.com
ValuWar	Advanced Competitive Strategies	www.competing.com
VizControls	InXight	www.inxight.com

Websites

Website	Contents
www.xml.org	Home page of the XML Organisation

Appendix 1 The Experts

Company Representatives

Name	Position when in Steering Group	Company
Ahola Jyrki	Director of Business Planning	UPM-Kymmene (Kaukas)
Allonen Heikki	VP Business Development	Metra Group (Wartsila)
Grundsten Henrik	Research Manager	Tekes
Heikkinen Leena	Business Analyst	Rautaruukki
Holopainen Sami	Business Analyst	Aspocomp Group
Huhtala Pertti	Director of Business Development and Administration	Helsinki Media (Sanoma-WSOY Group)
Kajanto Markus	Head of Strategic Planning	Nokia Group
Kosonen Mikko	VP Strategic Planning	Nokia Group
Makkonen Simo	Chief of Technology	Partek Group
Myllykoski Kimmo	Head of Strategic Planning	Nokia Group
Nihtilä Jukka	Business Planning Manager	Nokia New Ventures Organization
Pitkänen Perttu	Editor	Startel Online (Sanoma-WSOY Group)
Räsänen Erkki	Director of Business Intelligence	Rautaruukki Group
Sihto Matti	Research Manager	Tekes
Silvennoinen Eero	Research Manager	Tekes
Tikka Tommi	Development Manager	Fortum Service Oyj
Vehviläinen Osmo	Manager	Metso Service Oyj
Vuorikoski Mikko	Director of Business Development	Startel (Sanoma-WSOY Group)
Äyväri Heikki	Director of Development	Sonera Group

University Representatives

Name	Position	Institution
Carlson Lauri	Professor of Computer Linguistics	University of Helsinki
Carlsson Christer	Professor of Management Science	Åbo Akademi
Koskenniemi Kimmo	Professor of Computer Linguistics	University of Helsinki
Linnainmaa Seppo	Professor of Knowledge Technology	Government Research Centre, VTT
Ranta Jukka	Professor of Industrial Management	Helsinki University of Technology
Syrjänen Markku	Professor of Knowledge Engineering	Helsinki University of Technology

Appendix 2 Managers Interviewed

Name	Position	Company
Ahola Jyrki	Director of Finance	UPM-Kymmene (Kaukas)
Allonen Heikki	Managing Director	SRV Yhtiöt
Holopainen Sami	Business Analyst	Aspocomp Group
Huhtala Pertti	Director of Business Development and Administration	Helsinki Media (Sanoma-WSOY Group)
Jalonen Esko	Asset Manager	Ane Gyllenberg
Juuvinmaa Teuvo	Chairman of Board	Aspo
Kainu Pirjo	Value Added Services Manager	Observer Finland
Kajanto Markus	Head of Strategic Planning	Nokia Group
Kariola Erkki	Managing Director	3I Finland
Kontinen Kalevi	Director of Business Information Systems Platforms	Nokia Group
Kosonen Mikko	VP Strategic Planning and Information Systems	Nokia Group
Laaksonen Tero	Managing Director	Telia Finland
Makkonen Simo	Partner	Miraimon Oy
Myllykoski Kimmo	Business Development Manager	Nokia Mobile Phones
Nihtilä Jukka	Business Planning Manager	Nokia New Ventures Organization
Oesch Klaus	Partner	PCA Infocom Finance
Pitkänen Perttu	Editor	Startel Online (Sanoma-WSOY Group)
Räsänen Erkki	Director of Business Intelligence	Rautaruukki Group
Strömberg Juhani	Senior Vice President, Research and Development	TietoEnator Group
Tikka Tommi	Development Manager	Fortum Service Oyj
Turpeinen Marko	Vice President, Technology	AlmaMedia Business Information Group
Vaarnas Markko	Managing Director	Viva Business Intelligence
Vuorikoski Mikko	Managing Director	Single Source
Vuorinen Jussi	Planning Manager	Sanoma-WSOY Group
Äyväri Heikki	Director of Development	Sonera Group
Österman Riku	Manager of Business Intelligence	Sonera Group

Appendix 3 List of IPO Companies

No	SIC & Company Name
1	_BSQUARE_Inc
2	_eSAFETYWORLD_Inc
3	_Exactis.com_Inc_(InfoBeat_Inc)_(Mercury_Mail_Inc)
4	_GAIAM_INC
5	_Mariner_Energy_LLC
6	_Swiss_Natural_Foods_Inc
7	_Training_Devices_International_Inc
8	0273_GROWTEX_INC
9	1311_Appalachian_Basin_Royalty_Trust_(Eastern_States_Oil_&_Gas_Inc)
10	1311_SPINNAKER_EXPLORATION_CO
11	2070_BIO_AQUA_SYSTEMS_INC
12	2631_Packaging_Corporation_of_America
13	2721_MARTHA_STEWART_LIVING_OMNIMEDIA_INC
14	2741_U.Link_Inc
15	3344_GRIC_Communications_Inc
16	3391_IDT_Inc
17	3571_eMachines_Inc
18	3572_Headway_Technologies_Inc
19	3576_FOUNDRY_NETWORKS_INC
20	3576_SYCAMORE_NETWORKS_INC
21	3577_Crossroads_Systems_Inc
22	3577_Immersion_Corp
23	3577_SMARTDISK_CORP_(Fintos_Inc)
24	3629_Plug_Power_Inc
25	3661_CERENT_CORP
26	3661_MCK_Communications_Inc
27	3661_PC_TEL_INC
28	3663_LearnSat.com_Inc
29	3670_Cobalt_Networks_Inc
30	3672_Century_Electronics_Manufacturing_Inc
31	3674_Finisar_Corp
32	3674_JNI_Corp
33	3674_Next_Level_Communications_Inc
34	3674_Quantum_Effect_Devices_Inc
35	3674_QUICKLOGIC_CORP
36	3674_SILICON_IMAGE_INC

No	SIC & Company Name
37	3674_Virata_Corp
38	3679_ALTEON_WEBSYSTEMS_INC
39	3679_Sage_Inc
40	3732_Genmar_Holdings_Inc
41	3823_Rudolph_Technologies_Inc
42	3825_Agilent_Technologies_Inc
43	3841_VASCULAR_SOLUTIONS_INC
44	3845_Aspect_Medical_Systems_Inc
45	3845_ORATEC_INTERVENTIONS_INC
46	3949_SPORTSTRAC_SYSTEMS_INC
47	4210_UNITED_PARCEL_SERVICE_INC
48	4700_Expedia_Inc
49	4812_GOLDEN_TELECOM_INC
50	4812_Triton_PCS_Holdings_Inc
51	4813_Allied_Riser_Communications_Corp
52	4813_BTI_TELECOM_CORP
53	4813_Communication_TeleSystems_International_dba_WORLDxCHANGE_Communications
54	4813_deltathree.com_Inc
55	4813_iBasis_Inc_(VIP_Calling_Inc)
56	4813_Illuminet_Holdings_Inc
57	4813_OMNILYNX_COMMUNICATIONS_CORP
58	4813_PentaStar_Communications_Inc
59	4813_WORLDQUEST_NETWORKS_INC
60	4832_Pac-West_Telecomm_Inc
61	4832_RADIO_UNICA_COMMUNICATIONS_CORP
62	4832_Spanish_Broadcasting_System_Inc
63	4833_ACME_COMMUNICATIONS_INC
64	4841_CHARTER_COMMUNICATIONS_INC
65	4841_GOLDEN_SKY_DBS_INC
66	4841_TIVO_INC
67	4899_PNV.net_Inc
68	4899_XM_SATELLITE_RADIO_HOLDINGS_INC
69	4922_Atlas_Pipeline_Partners_LP
70	5009_BAKER_et_TAYLOR_CORP
71	5045_Precis_Smart_Card_Systems_Inc
72	5065_Somera_Communications_Inc
73	5199_SciQuest.com_Inc

No	SIC & Company Name
74	5499_MotherNature.com_Inc
75	5621_CHARLOTTE_RUSSE_HOLDING_INC
76	5812_Carlson_Restaurants_Worldwide_Inc_(Friday's_Holdings_Inc)
77	5812_Jillian's_Entertainment_Holdings_Inc
78	5812_NEW_YORK_RESTAURANT_GROUP_INC
79	5912_PLANETRX.COM_INC
80	5945_ASHFORD.COM_INC_(NewWatch_Co)
81	5945_SmarterKids.com_Inc
82	5947_AmericanGreetings.com_Inc
83	5947_Starboard_Cruise_Services_NV_(Miami_Cruiseline_Services_Holdings_I_BV)
84	5961_E-Stamp_Corp
85	5961_iGo_Corp_(BATTERY_EXPRESS_INC)
86	5961_Intellesale.com_Inc
87	5961_Rainmaker_Systems_Inc
88	5961_VITAMINSHOPPE.COM_INC
89	6021_Coastal_Banking_Company_Inc
90	6021_GREENVILLE_FIRST_BANCSHARES_INC
91	6021_LEHIGH_ACRES_FIRST_NATIONAL_BANCSHARES_INC
92	6035_MFS_Financial_Inc
93	6035_Security_Financial_Bancorp_Inc
94	6036_AMERICAN_FINANCIAL_HOLDING_CORP_INC
95	6159_FIDELITY_LEASING_INC
96	6162_AMERICAN_HOME_MORTGAGE_HOLDINGS_INC
97	6162_Auto_Credit_Acceptance_Ltd_(d_b_a_autocreditaccept.com)
98	6200_ALARON.COM_HOLDING_CORP
99	6211_Empire_Financial_Holding_Co
100	6211_Web_Street_Inc
101	6282_NEUBERGER_BERMAN_INC
102	6531_HOMESERVICES.COM_INC
103	6711_MAIN_STREET_BANKS_INC
104	6719_John_Hancock_Financial_Services_Inc
105	6720_LCM_Internet_Growth_Fund_Inc
106	7300_RESOURCEPHOENIX.COM_INC
107	7310_Digital_Impact_Inc
108	7310_L90_Inc
109	7319_ADSTAR_COM_INC
110	7319_NETCREATIONS_INC

No	SIC & Company Name
111	7363_STRATUS_SERVICES_GROUP_INC
112	7370_Digimarc_Corp
113	7370_NETZERO_INC
114	7370_STRATABASE.COM
115	7370_ZAPME!_CORP
116	7371_Cysive_Inc
117	7371_DPEC_Inc
118	7371_INTERTRUST_TECHNOLOGIES_CORP
119	7371_MetaSolv_Software_Inc
120	7371_PREDICTIVE_SYSTEMS_INC
121	7371_Preview_Systems_Inc
122	7372_ALPHACOM_INC
123	7372_Andromedia_Inc
124	7372_BLUESTONE_SOFTWARE_INC
125	7372_BOOKDIGITAL.COM_INC
126	7372_BROADBASE_SOFTWARE_INC
127	7372_CALICO_COMMERCE_INC
128	7372_DALEEN_TECHNOLOGIES_INC
129	7372_E.PIPHANY_INC
130	7372_E-Cruiter.com_Inc
131	7372_EGAIN_COMMUNICATIONS_CORP
132	7372_GetThere.com_Inc
133	7372_GLOBAL_FOODS_ONLINE_INC
134	7372_iManage_Inc
135	7372_INTERWOVEN_INC
136	7372_KANA_COMMUNICATIONS_INC
137	7372_Mediaplex_Inc
138	7372_NFOX.COM
139	7372_OnDisplay_Inc
140	7372_PIVOTAL_CORP
141	7372_Quintus_Corp
142	7372_Retek_Inc
143	7372_SkillSoft_Corp
144	7372_SonicWALL_Inc
145	7372_TELEMATE.NET_SOFTWARE_INC
146	7372_THINWEB_COM_CORP
147	7372_VIADOR_INC
148	7373_Aether_Systems_Inc

No	SIC & Company Name
149	7373_HOJO_Holdings_Inc
150	7373_Landacorp_Inc_(Landa_Management_Systems_Corp)
151	7374_BE_FREE_INC
152	7374_eMed_Technologies_Corp
153	7374_INTERNAP_NETWORK_SERVICES_CORP
154	7374_INTRALINKS_INC
155	7374_MedicaLogic_Inc
156	7374_TRIZETTO_GROUP_INC
157	7374_US_Audiotex_Corp
158	7375_ARTISTdirect_Inc
159	7375_CIRCLE_GROUP_INTERNET_INC
160	7375_DIGITAL_INSIGHT_CORP
161	7375_GORACING.COM_INC
162	7375_LinuxOne_Inc
163	7375_McAfee.com_Corp
164	7375_Netzee_Inc
165	7375_The_Knot_Inc
166	7379_AGENCY.COM_Ltd
167	7379_Andover.net
168	7379_comstar.net_Inc
169	7379_DATA_RETURN_CORP
170	7379_eSpeed_Inc
171	7379_FASTNET_Corp
172	7379_KEYNOTE_SYSTEMS_INC
173	7379_NAVISITE_INC
174	7380_Wireless_Facilities_Inc
175	7389_AdKnowledge_Inc
176	7389_Akamai_Technologies_Inc
177	7389_ASD_Systems_Inc
178	7389_BREAKAWAY_SOLUTIONS_INC
179	7389_Collectors_Universe
180	7389_FreeMarkets_Inc
181	7389_NETCENTIVES_INC
182	7389_PFSweb_Inc
183	7389_WEBVAN_GROUP_INC
184	7812_Digital_Entertainment_Network_Inc
185	7812_SMA_REAL_TIME_INC
186	7929_WORLD_WRESTLING_FEDERATION_ENTERTAINMENT_INC

No	SIC & Company Name
187	7999_Silicon_Entertainment_Inc
188	8200_EDISON_SCHOOLS_INC
189	8532_Harris_Interactive_Inc
190	8700_Jupiter_Communications
191	8731_CALIFORNIA_MOLECULAR_ELECTRONICS_CORP
192	8731_SFBC_International_Inc
193	8731_Symyx_Technologies_Inc
194	8741_TrueVision_International_Inc
195	8999_HEALTHEXTRAS_INC