ECONOMISCHE SOCIALE EN POLITIEKE WETENSCHAPPEN EN SOLVAY BUSINESS SCHOOL

Vrije Universiteit Brussel

THE CONTRIBUTION OF BUSINESS INTELLIGENCE TO STRATEGIC MANAGEMENT

Jochen Fries

Dissertation submitted in partial fulfilment of the requirements
for the Master degree in Business Information Management.

Promotor: Prof. Dr. E. Torfs

- 2006 -

Acknowledgements

Whilst accomplishing the degree of Master in Business Information Management I would like to express my sincere thanks for contributions to this dissertation to a few people. Each of them has contributed in its own way to achieving this result.

First of all I owe many thanks to Prof. Dr. Eddy Torfs for giving me the opportunity to work at this topic. I thank him for the trust and confidence, useful suggestions, and liberty he gave me to accomplish this dissertation. Furthermore, I would like to thank Dr. Dirk Kenis for the guidance in defining this dissertation's subject.

Thanks are also due to my parents who gave me the opportunity again to follow this Master-after-Master education. I not only thank them for financial support, they did also give me the moral support and confidence I definitely needed. I thank my brother Dietrich as well who looked on how I accomplished this dissertation.

Finally I would like to express thanks to my fellow BIM students for this year of international flavoured experience. Together with my friends, they also supported me to accomplish this dissertation.

Jochen

Table of Content

Executive Summary

This dissertation's subject deals with both my past experiences and my future expectations. With the degree of master in applied economics I have always been attracted to strategic management because of its big thinking features. Like a military general such as Sun Tzu, defining the corporate direction taking all game theories into account like a chess game is definitely one of my passions. Therefore I would like to dig into this material even more thoroughly and discover what data and information sources are needed to defining this corporate strategy. Concerning my future expectations, business intelligence is likely to boom for the next few years. When Big US business intelligence software providers such as SAS, MicroStrategy and Business Objects announced their 2004 company results, expectations on Wall Street were abundantly exceeded. Also in 2005 the turnover of this sector increased exponentially. Therefore, I am quite confident in the next few years business intelligence will even more boom in Western Europe than it does now. As you will see in chapter 3, business intelligence is not just about IT, it deals with processing of business information. Therefore, aligning business intelligence with strategic management was in my opinion a nice subject for this dissertation.

The first chapter is starting very general with definitions and concepts concerning strategy and strategic management. To remain competitive, strategic decisions based upon valuable information need to be taken. The competitive intelligence cycle is a mean to define these information needs. Using this intelligence cycle throughout his many years of career, Herring defined 3 categories of intelligence needs to support strategic decisions. After discussing these categories, the use and the need for some popular strategic management techniques are discussed.

Chapter 2 discovers all functional capabilities of business intelligence tools. After some definitions, business intelligence architecture is briefly discussed and the need for data warehousing will be explained. Next, the 3 main categories of business intelligence tools, namely reporting, OLAP, and data mining, are discussed. The main goal of this chapter is to discover all possible BI functionalities and their business applications.

Chapter 3 deals with the business relevancy of these business intelligence functionalities. I start by figuring out to what organizational level business intelligence is contributing. At strategic level the balanced scorecard will be introduced and aligned with business intelligence provisions. Also tactical and operational levels are likely to benefit from business intelligence tools. In the rest of the chapter I will align these business intelligence functionalities with Herring's key intelligence topics. Finally, I will also discuss the contribution of business intelligence to the 3 strategic analysis techniques of chapter 1. Obviously, not all intelligence needs could be fully covered by business intelligence, but my expectations were fulfilled.

Chapter 4 illustrates the practical functionalities of BI tools in practice and aligns them with the theoretical 'requirements' described in chapter 2. Therefore, Microsoft SQL Server 2005 and SAS BI Enterprise BI Server are described and checked whether they fulfil to these theoretical requirements. Both of the tools definitely fulfil the requirements.

In chapter 5 a real life case of an implementation of BI is discussed. I start by situating MTV Europe and discussing the problems they were facing. To remain competitive, MTV Europe chose to invest in business intelligence technology. I will discuss what components they had installed and what the benefits are for MTV Europe in strategic point of view. Finally, in chapter 6 I will express my major conclusions of this dissertation.

Chapter 1 Strategic Management

In this first chapter I will focus on strategic management, more specifically on the strategic intelligence needs. Quality of information is essential in order to optimize decision making. Better decisions lead to competitive advantage and a strong market position which is definitely one of companies' ultimate goals. The main purpose of this chapter is to discover what the needs are in strategic management. In a second chapter will be checked whether the solutions of Business Intelligence match these needs.

Concepts as 'strategy' and 'strategic management' will be explained in section 1.1. The link to and importance of competitive intelligence is declared in section 1.2. One of the most important aspects within this competitive cycle is the identification of the users' needs of intelligence, which are called the key intelligence topics (KIT's) in section 1.3. In the fourth section 1.4 some important strategic analysis methods will be explained.

1.1 From Strategy to Strategic Management

1.1.1 Strategy

Literature does not provide one and unique definition of strategy. Nowadays managers like to use the word "strategy" very often and in many different contexts as well. Strategy is not for nothing called the highest level of manager activities. So, to different people strategy means different things. Famous economics have their own particular view on strategy. For example Wright et al., 1992, describe strategy as plans for the top management which should lead to results matching mission and goals of the organisation.

1.1.1.1 Henry Mintzberg

Henry Mintzberg provides in his famous book, Five P's for Strategy, 1992, 5 definitions of strategy: plan, ploy, pattern, position and perspective.

Strategy as a plan can be compared with a sort of guideline to deal with a situation. In this definition strategy contains two essential characteristics. A plan is made in advance to deal with the future situation, and they are designed with a strong focus on a certain purpose. Strategy can be defined as a ploy as well when a specific action towards a competitor is stressed. Strategy is a consistent pattern in a series of actions to be undertaken. While a plan might be an intended strategy, a pattern is a realized strategy. Strategy is a position or a specific location of the company in its environment. In this definition of strategy Mintzberg stresses a favourable position requires equilibrium between the organization and its environment, or between its internal and external context. Finally strategy is a perspective shared by members of the organisation through their intentions and their actions, united by a common vision.

1.1.1.2 Michael Porter

Some aspects of strategy have remained over time. For example winning strategies must be founded on originality, the delivery of value towards customers, different than competition does. In his book, Competitive Strategy, 1980, Michael Porter states a company only can outperform competition if it can establish a difference of value to customers, which can be maintained over a long period of time.

"It means deliberately choosing a different set of activities to deliver a unique mix of value."

These distinctive competences contain all resources and capabilities of an organisation, which are unmatched by competitors, and explain the origin of the economic value of the organisation. A competitive advantage is the distinct way an organisation is positioned in the market to obtain an advantage over competitors. As a result this advantage generates a sustained level of profitability above the industry average. Organisations that identify opportunities to create such a distinctive competence allow the firm to gain economic returns above those under condition of perfect competition. A company's main goal is to protect and to sustain these conditions as long as possible. In other words, sustainability of competitive advantage refers to maintaining economic value generated by distinctive competences and to protect them from both imitation as well as substitution.

1.1.2 Strategic Planning Process

The process that mainly supports the process of attaining competitive advantage is the strategic planning process. The strategic planning process scans the shared values of an organisation and its internal and external environments. These factors are compared with the future goals of the organisation, which enables to define concrete objectives and tactics to achieve that goal. Continuous evaluation and adaptation of the planning process enables the company to achieve its goals within changing environments. Figure 1 shows a simplified view of the strategic planning process.

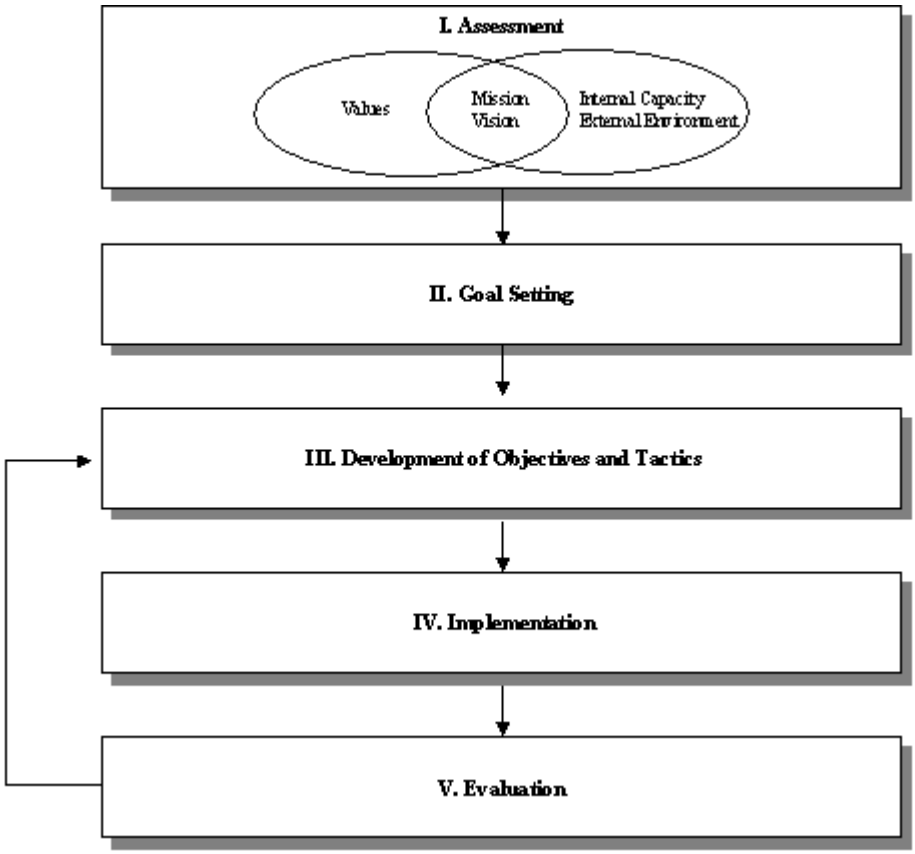

Figure 1 Strategic Planning Process (Source: Lenoir-Rhyne College[1], 2004)

[1] http://www.lrc.edu/planning/

1.1.3 Strategic Management

Strategic planning is necessary but not sufficient to survive as a company. This process is only the first part of another larger process. Strategic management consists of strategic planning or analysis, making strategic decisions, and execute actions in order to create sustainable competitive advantage. Besides strategic planning, leaders must take strategic decisions. These decisions concern what industry an organisation is active in, as well as the way to compete in those industries. These decisions need to be transformed into actions in order to become effective. These actions often cover allocations of resources to conduct the organisations towards its intended goals. Another aspect of strategic management is to create sustainable competitive advantage in order to outperform competition (Dess et al., 2005). More information on creating competitive advantage was already discussed in 1.1.2. . Bensoussan & Fleisher, 2003, argue:

"Strategic management is conducting an organisation that has as its ultimate objective the development of values, managerial capabilities, organisational responsibilities and administrative systems that link strategic and operational decision making, at all hierarchical levels and across all lines of authority."

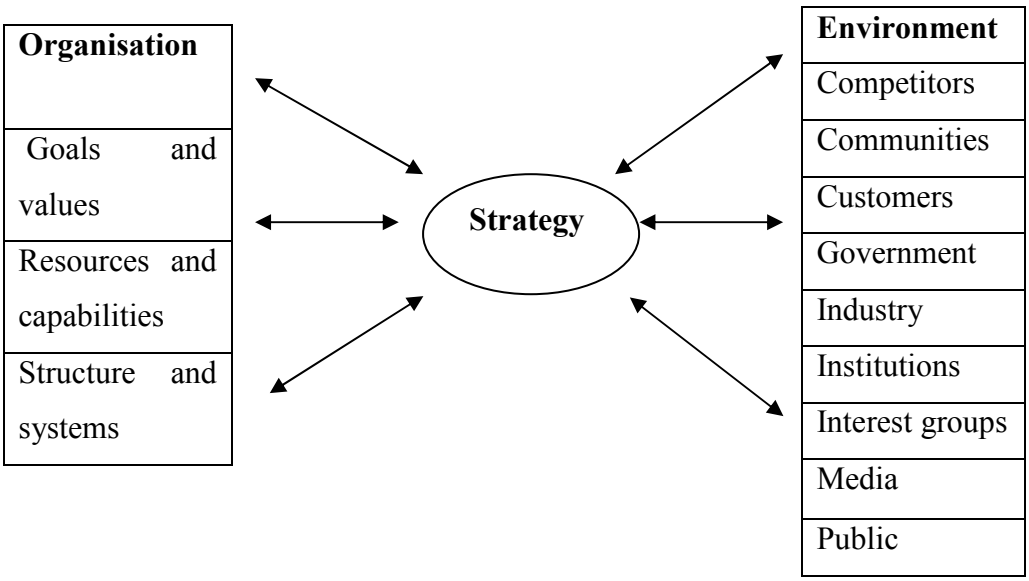

Figure 2 Strategic Management Framework (Source: Bensoussan & Fleisher, 2003)

Figure 2 illustrates every element in both the organisation and the external environment affects the strategy of a firm. Moreover, these elements might affect some of the other elements as well. Strategy focuses on the alignment between all elements over time and space. The role of the strategic management framework is to support the decision making process. The leader must know which elements are affected by which decision, and therefore an alignment as tight as possible is needed among all involved elements in order to make effective strategic decisions. By taking all elements into account the strategic analyst analyses and tries to understand how to position the organisation in such a way that this alignment is as optimal as possible. The process to get to this understanding is called the competitive intelligence cycle.

1.2 Competitive Intelligence Cycle: Making Decisions

Now, finally we reached the critical point of this chapter as we are to discover information needs for this competitive intelligence process. Competitive intelligence should support the organisation to make more efficient strategic decisions. Strategic decisions are taken rarely, have large implications on the level of competitiveness of an organisation, have large impact on other subsequent decisions and are more difficult to reverse than tactical or operational decisions.

1.2.1 Information vs. intelligence

Before keeping on focussing on the definition of appropriate intelligence needs for strategic decisions, first the difference between information, knowledge and intelligence needs to be explained.

Till a few years ago, in my opinion, the word ‘knowledge’ was a promising concept for the future when a company could implement or at least use this term. Filtered and processed information is still an issue. Sharing this essential interpreted would enable the company to establish competitive advantage based upon this knowledge. Nowadays, ‘intelligence’ seems to be something superior and reaches an even higher level of intellectual activity. “No words, but action”, that could be a definition of intelligence.

Based upon the processing of information and knowledge, intelligence is a filtering of only this particular part of information not only leading to knowledge, but to action. Moreover, in my opinion, what is the utility of knowledge if no actions can be decided upon?

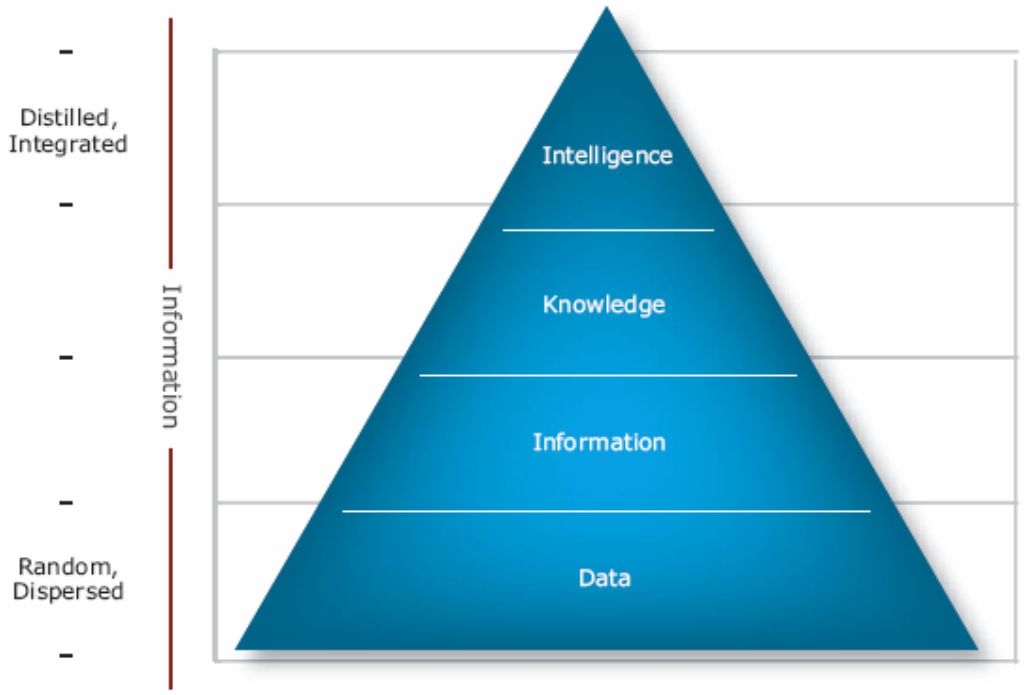

Figure 3 Intelligence Pyramid (Source: Global Intelligence Alliance, 2004)

Sawka, 1996, defines intelligence as 'actionable information' about customers, competition, market situation, or any other external factor. Using the right analysis techniques and interpretation information can be turned into actionable intelligence. Notice that analysis and interpretation implicitly require human intervention. In other words competitive intelligence does not exist without human brains. This human aspect needs to be stressed because in my opinion people underestimate their huge responsibilities, which are still indispensable in competitive decision making. Like any other intelligence system, the main goal for competitive intelligence is to support, facilitate and improve decision making. For this reason, information without any link to action or intelligence is useless for a strategic decision maker. As a consequence, since a leader might be more action oriented with the means of intelligence in stead of information, he might more focussing to the future. A scenario analysis, based on forecasts, is a method supporting taking decisions and actions in the future and will be

discussed at the end of this chapter. It is clear that such a scenario analysis is carried out much more precise when intelligence is used in stead of ordinary information. Since intelligence is an interpretation and analysis of information, a leader is not only able to react on certain future situations, he can also proactively steer his company giving the right direction with the right actions. The information pyramid in figure 3 shows at the bottom large amounts of data is available in an organisation. The more we climb onto the top op the pyramid, the volume of information decreases together with its scope. Notice on the top intelligence refers to filtered information, and to a higher level of quality of information. A leader or decision maker at the top of an organisation only needs the essence of information, interpreted and analysed, which is of the highest quality, in order to take specific decisions and actions ensuring competitive advantage.

1.2.2 Competitive intelligence

Competitive intelligence then provides top managers specific intelligence of external factors in order to discover the company's hidden strengths or weaknesses. Therefore I think not only scenario analysis but also SWOT analysis might be carried out much more precise using the right intelligence. I will discuss them in detail in 1.4.

Herring (1992) identifies two categories of information needs for business strategy formulation. The first category covers all internal information concerning capabilities and resources, while the second is concerned with external environment information. The latter category defines the industries environment as it provides information on e.g. customers, competition and industry structure. These factors are very detailed considered in the competitive intelligence process.

1.3 Key Intelligence Topics: Defining the Intelligence Needs

In previous paragraphs intelligence sounds to be the solution for every company to improve their competitive advantage. Research of Herring, 1999, confirms that in companies without intelligence needs face poor performance and frustration in their CI department. On the other hand companies with a formal intelligence-needs-

identification-process do gain from their successful CI programs. But why don't have many companies have such a CI department? A reason for this might be the difficulty to track the exact intelligence needs for a given strategy.

Herring, 1999, argues that having an interview with the decision maker is one of the best ways to define their needs. He also stressed the interview needs to be a bidirectional communication in order to define the real critical intelligence needs, which Herring calls *Key Intelligence Topics* or KIT's. Herring experienced many cases the senior management needed to be coached and educated to interact about information and to specify their needs! Identification of the KIT's is also the first step in the intelligence cycle. The better managers know their intelligence needs, the better they can specify them, and the better they will provided by the CI department. Figure 4 illustrates competitive intelligence is a continuous process done by the CI manager or department in order to provide decision makers the needed essential intelligence.

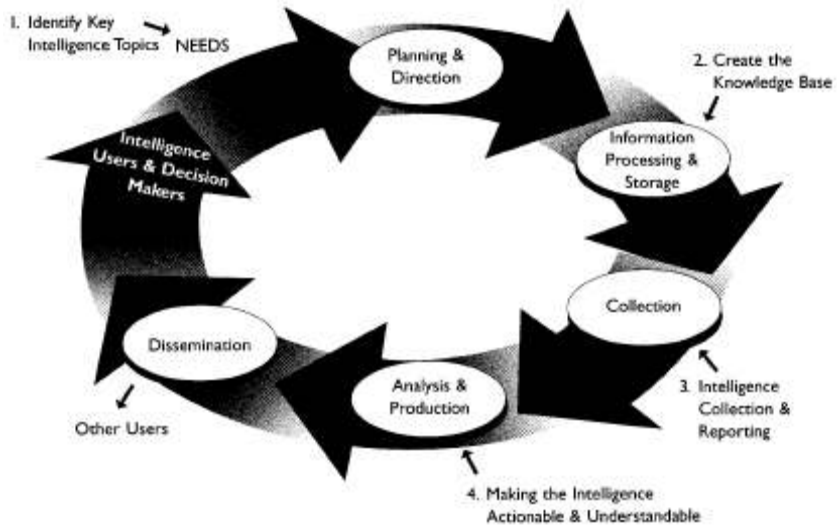

Figure 4 Intelligence Cycle (Source: Herring, 1999)

Herring has many years of experience in implementing business intelligence programs. For many years Herring was National Intelligence Officer for identifying the US Government's national level for intelligence needs. Afterwards he became intelligence consultant for multinationals as Motorola, Texas Instruments, Ford Motor Credit and many more. As mentioned above, during these years he developed the concept of Key

Intelligence Topics and implemented them over 1000 times. I believe his research has an immense value and for this reason I would like to rely on them for this dissertation.

Table I : Strategic Decisions & Issues (Herring, 1999)

1. Provide intelligence inputs for the company's strategic plan to create our **future competitive environment**.
2. Formulating our **global competitive strategy**: assess the role of competitors in achieving our business objectives.
3. **Globalization** of our industry: how and with whom should we proceed? What are our competitors doing and with whom?
4. Asian/south American/etc. **market development**: assess current competitive situation; describe the most likely future situations.
5. Strategic **investment** decisions: identify and assess changes in the competitive environment, including: • critical industry investments by others • cash requirements of other industry companies • role of investment community • possible alternative sources for future investments, including alliances, acquisitions, etc.
6. Should we **expand** our present production capacity or build a new plant with more cost-effective manufacturing?
7. What plan and actions must we take to maintain our **technological competitiveness** on our major competitors?
8. **Product development** program: identify and assess the program of our leading **competitors** and assess the status of other competing technologies.
9. New product development and launch: How and when will the **competitors respond**? And how will they affect our plan?
10. How will our new distribution/sales/marketing strategy be **viewed** by the industry? Our competitors? Our distributors?

He discovered that senior managers' intelligence needs are quite similar over time and space, and put them in three categories which are described below. In my opinion, intelligence needs may depend on industry specific needs, firm specific needs, and may

change over time as well. Nevertheless, I think the three intelligence categories really do make sense. In tables I, II and III Herrings' most frequently used intelligence needs top 10 of respectively strategic decisions and actions, early-warning KIT's and key player KIT's are described.

Table II : Early-Warning KIT's (Herring, 1999)

1. Areas of possible **technological breakthrough** that could affect dramatically our current and future competitiveness.
2. **Technological developments**, affecting either production capabilities or product development and their uses by competitors and others.
3. Status and performance of key **suppliers**: • their financial "health" • cost and quality problems • possible acquisition and/or alliances
4. Possible **disruptions in supplies** of crude-oil/components/etc.
5. Change in our **industry procurement policies** and processes.
6. Change in customers/competitors **perceptions** of us or our services.
7. Companies and/or combinations of companies, considering to **entry into our business** or markets.
8. **Changes in international** political, social, economic or regulatory situations that could affect our competitiveness.
9. **Regulatory** issues: near-term changes; deviations in long term trends; other governmental changes that could impact current regulatory regimes, e.g. people, policy, etc.
10. Intelligence on **alliances, acquisitions and divestitures** among our competitors, customers and suppliers: • reasons and forces causing them • objectives and purposes of completed deals

Table III : Key Player KIT's (Herring, 1999)

1. Provide **profiles** of our major competitors, including their strategic plans, competitive strategies, financial and market performance, organisation and key personnel, R&D, operations, sales and marketing, etc.
2. Provide in-depth **assessments of key competitors**, including: • their competitive intent towards us and our major customers • strategic plans and goals, including international objectives • key strategies: financial, technological, manufacturing, business development, distribution, and sales and marketing • current operational and competitive capabilities
3. Identify **new and emerging competitors**, particularly those coming from entirely different industries and businesses.
4. Describe and assess our **current and future competitive environment**, including: customers and competitors; market and suppliers, production and product technologies; political and environmental; and the industry's structure, including changes and trends.
5. **New customers**, their needs and future interests: what are they and how are our competitors trying to satisfy them?
6. Industry and customer **views, attitudes and perceptions** regarding "worth" of our branded products, services, etc.
7. Identify and assess **new industry/market players**, including: suppliers, major distributors, customers and/or competitors considering to entry into our business.
8. **New technology/product developers**: what are their plans and strategies for competing in our industry?
9. Need significant improvement in **market share and growth data**, including that of our competitors.
10. Management and operations need better intelligence concerning **regulatory and environmental activities** for planning and decision making.

1. Strategic Decisions and Actions contain the very essential fundaments a company needs to exist. They include intelligence needs for the development of strategic plans and strategies.
2. Early-Warning KIT's indicate external parameters by which the management does not want to be surprised. They include the capability to discover possible opportunities, but too often they refer to the management's fears. Early-warning topics are used then to translate these concerns into business actions. Notice that these topics are very useful in the SWOT analysis.
3. Key Players KIT's are needed to better understand all parties in the marketplace. Therefore this category only indirect leads to action, unlike the other categories. Notice that Porter's five powers model is useful to identifying those parties.[2]

1.4 Techniques

We finally defined some common intelligence needs at the strategic level of a company. More specific, we have an overview of the intelligence needs in order to take strategic decisions with the purpose to improve competitive advantage. Decision makers, top managers and analysts often use strategic models either to apply or to produce these intelligences. What does it mean for example if a competitor implements an emerging technology? Interpreting is the last step to really make the decision, and most of the times analytical techniques are required. Implementing both data and intelligence into models will definitely improve the analysis and might unveil some hidden aspects as well, as they produce the real intelligence. As a result, quality of decisions is improved as well as their subsequent actions. Below most famous and common strategic analysis techniques will be discussed, namely the SWOT analysis, the BCG analysis and the scenario analysis. I will try to put them in reference of this dissertation and therefore I don't discuss them in detail.

---

[2] Porter,1980, defined 5 forces affecting an industry's structure. Initiators of these forces are entrants, suppliers, substitutes, buyers, and internal rivals and can be taken into account while defining the key player KIT's.

1.4.1 SWOT Analysis

SWOT is an acronym for strengths, weaknesses, opportunities and threats. The main goal of this analysis is to align an organisation's internal capabilities, namely strengths and weaknesses, and external possibilities, namely opportunities and threats. The power of this technique and its importance in this dissertation is that it can be applied upon competitors as well. In other words this technique, when correctly used, might support the improvement of competitive advantage. Figure 5 illustrates the SWOT model with the link to competitive advantage.

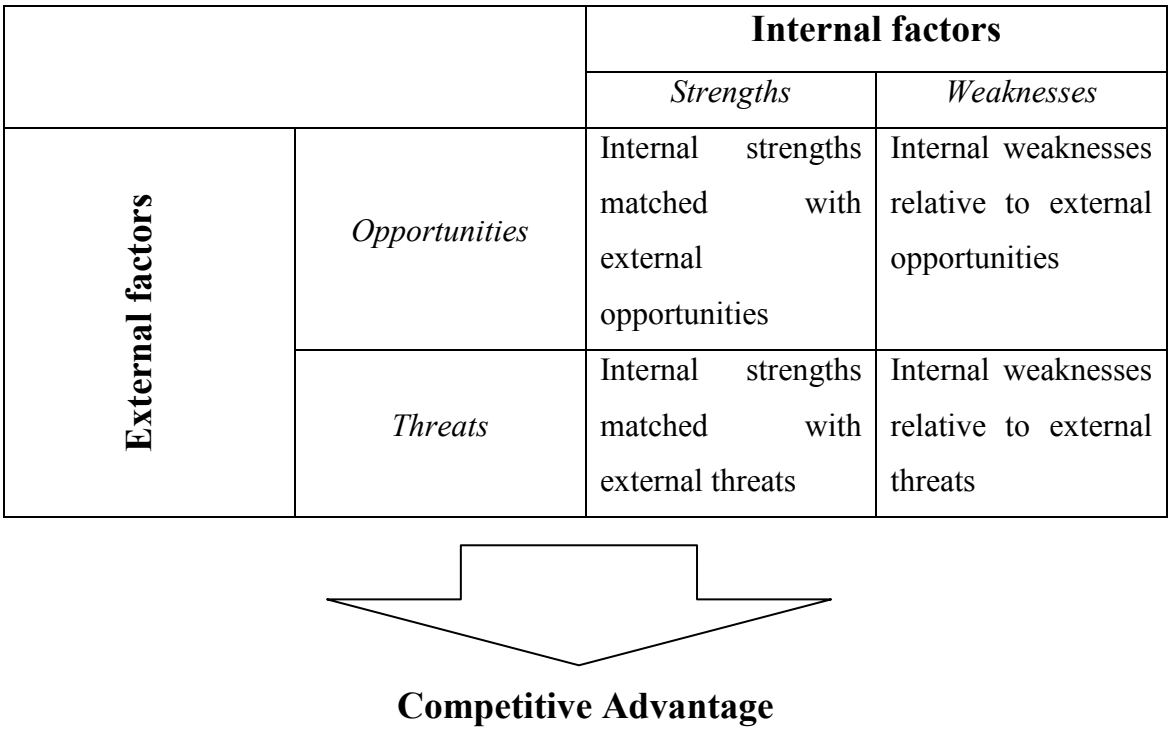

Figure 5 SWOT Model (Source: Hill & Westbrook, 1997)

In the SWOT model data as well as intelligence concerning strategic decisions might be helpful defining both internal and external factors. For example an expansion of present production capacity might result into an internal strength. The development and launching of a new product might refer to either an internal strength or an external threat. Intelligence needs concerning early-warnings and key players in the market

space are obviously needs to help identifying a company's external opportunities and threats. For example, if a company is able to map all relevant technological breakthroughs, the probability to discover and to implement this successful technology increases drastically. The needs and future interests of new customers are might be a huge opportunity on the one hand, but on the other hand might it be a huge threat as well. Notice that the key intelligence needs are very important inputs to make SWOT analyses of some major competitors too. Doing so might definitely contribute to the improvement of a company's competitive advantage.

1.4.2 BCG Growth/Share Portfolio Matrix

The Boston Consulting Group (BCG) growth/share portfolio matrix, designed by the Boston Consulting Group, is a technique to support companies active in multiproduct and/or multimarket businesses to diagnose the corporate level strategy. The model provides both a framework to assembly the optimal business portfolio and generic strategies to improve resource allocation across this optimal business portfolio. Products or strategic business units (SBU's) are rated on attractiveness, which is measured by market growth, and competitive position, measured by relative market share. The latter is measured by the business unit's market share relative to the one of its largest competitor in the industry. Figure 6 illustrates the graphical presentation of the BCG matrix.

The matrix defines 4 main SBU categories: stars, cash cows, question marks and dogs. Besides, the model provides an overall strategic sequence integrating these categories. The low growth rate and high market share of the cash cows result in large cash flows. Investments were already done in the past, now time has come to milk the cash. Since both stars and problem children are high growth rate business units, they require heavy cash investments. Stars need cash inflow to ensure further growth and finally eventually become cash cows. Problem children will evolve into stars or dogs, depending on the market share. If, after heavy cash investment, market share increases, problem children might probably evolve into stars and finally perhaps into cash cows. If market share cannot grow, problem children will become dogs, and need no further investments (Hax & Majluf, 1983).

Applying this technique requires a division of a company into strategic business units. For this, intelligence might be needed for example identifying competitors' strategic business units. Measuring the market growth rate and relative market share require sometimes detailed investigations on both your own company as well as on competitors or other market players and are therefore quite data based inputs. The outcome of this technique is most important as it produces really actionable information. The decision maker might really know in which SBU's he has to invest or divest. Notice that this technique is to be applied not only on your own company, but also on competitors in order to obtain insight in possible competitive advantages.

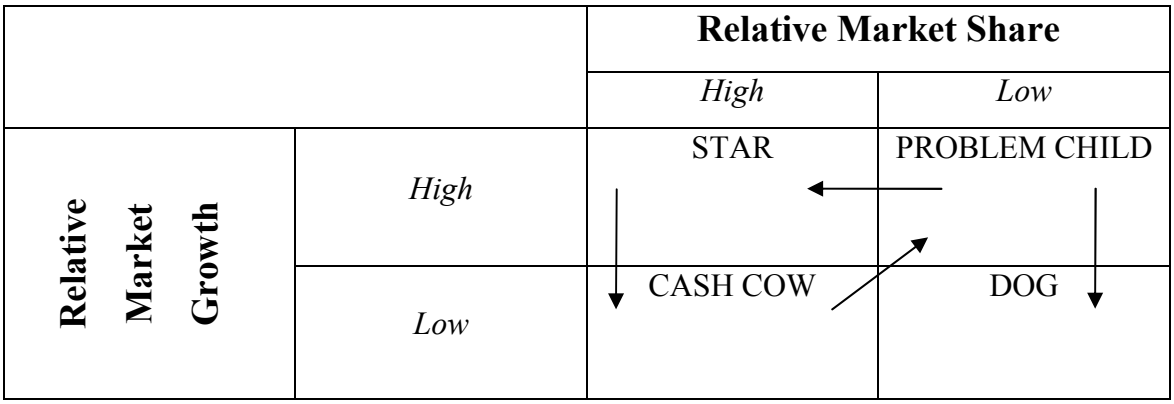

Figure 6 BCG Matrix (Source: Hax & Majluf, 1983)

1.4.3 Scenario Analysis

A scenario is a detailed description of what the future may look like based upon some assumptions affecting the business in one way or another. Notice that these scenarios exist under uncertainty. Scenario analysis is a method to manage and structure several scenarios in order to not underestimate either overestimate changes in the business landscape. In other words, it provides a framework for present and future strategic decisions (Schoemaker, 1995).

According to Schoemaker, 1995, applying this technique can be done by following 10 steps. These steps most of the time result in a few constructed scenario plots. Only a

few scenarios can be developed very detailed and each of them represents a plausible future.

1. Define the scope of the analysis: set the time frame and scope in terms of products, markets, customers, technologies and geographical areas. Define what knowledge would be extremely valuable to your company.
2. Identify the major stakeholders: what parties will have an interest in some important issues in the future? How have they changed over time?
3. Identify the basic trends: what trends are affecting your business in one way or another? Why do they affect your business?
4. Identify uncertainties: which outcomes that possibly affect your business are uncertain? Determine possible outcomes for each uncertainty (e.g. technology X developed or not developed).
5. Construct initial scenario themes: many ways are possible but a common used technique is to create 2 extreme worlds/scenarios, one containing all positive elements and the other one all negative elements.
6. Check for plausibility and consistency.
7. Develop learning scenarios: some general themes should have emerged from previous steps. Identify those which are strategically relevant for your company, with trends and outcomes around these themes.
8. Identify research needs: if e.g. you might need more information on a stakeholder's behaviour in a certain scenario.
9. Develop quantitative methods: check whether interactions between scenarios should be confirmed by a quantitative model.
10. Evolve toward decision scenarios: ask yourself whether the scenarios really address the issues your company is facing and the importance of them to take decisions.

As these 10 steps point out, these needs for intelligence refer to the needs Herring identified in his research.[3] Step 2, 3 and 4, namely identifying stakeholders, trends and uncertainties, clearly refer to the early-warnings and key player intelligence needs. Of course, identifying general trends also refer to the first category, namely strategic

[3] See 1.3 Key Intelligence Topics

decisions and issues. Step 8 definitely refers to intelligence in general, as a company often needs to dig more thoroughly into unknown issues in order to improve understanding of trends for example. The outcome of a scenario analysis might be competitive intelligence as the decision maker really knows what actions to undertake in what scenario. In other words, doing this properly in your own company as well as in the competitions' companies might result into competitive advantage.

Scenario analyses are widely used in both private and public sectors. Figure 7 shows the long range scenario space of the US Coast Guard in 2003. As you can see on the horizontal axis 4 parameters are defined who could possibly affect their long range strategic planning. On the vertical axis you can see the five scenarios the Coast Guard chose based upon the scheme. For these scenarios the Coast Guard developed 10 strategies in order to be prepared on any of the 5 situations.

	Role of federal government		*US economic vitality*		*Perceived threats to USA*		*Demand for maritime services*	
	Limited	*Substantial*	*Weak*	*Strong*	*Low*	*High*	*Low*	*High*
	✗		✗		✗		✗	
	✗		✗		✗			✗
	✗		✗			✗	✗	
Balkanized America	✗		✗			✗		✗
Planet enterprise	✗			✗	✗		✗	
	✗			✗	✗			✗
	✗			✗		✗	✗	
	✗			✗		✗		✗
		✗	✗		✗		✗	
		✗	✗		✗			✗
		✗	✗			✗	✗	
Taking on water		✗	✗			✗		✗
		✗		✗	✗		✗	
Pax Americana		✗		✗	✗			✗
Pan American highway		✗		✗		✗	✗	
		✗		✗		✗		✗

Figure 7 US Coast Guard Long Range Planning Space (Source: Kennedy, Perrottet and Thomas, 2003)

1.5 Conclusion

The main goal of this chapter is to define the information needs at the strategic level of a company. Firstly, an overview of some theoretical concepts of strategy and strategic management is given. Taking decisions at strategic level in order to obtain competitive

advantage requires the right definition of intelligence needs. This process can be supported by the competitive intelligence cycle. Based upon research of Herring some practical examples of intelligence needs are provided in section 1.3. Finally some important strategic analysis techniques are described and put into perspective of these intelligence needs. Chapter 2 will unveil the main business intelligence solutions and their information provisions. Finally these provisions are checked whether they match the earlier defined intelligence needs of this chapter.

Chapter 2 Business Intelligence

In section 2.1 of this chapter first a short theoretical overview of some definitions of Business Intelligence (BI) is discussed. In section 2.2 I will focus on the BI architecture by putting it in the organization's environment. In section 2.3 most common used BI tools will be explained, namely reporting, OLAP and data mining. After the technical description of these tools also their business relevancy will be checked.

2.1 Definition and Statements

In the literature we find lots of different approaches to a proper definition of Business Intelligence (BI). Different parties such as IT vendors, press groups and business consultants have their own approach to this subject. Below a few examples are described. Together they should illustrate the main concept of business intelligence.

Gartner Group describes BI as a process of transformation from data to information, and after a voyage of discovery transforming this information to knowledge.[4] Vriens & Philips, 1999, found out BI as a process of acquiring and processing of information in order to support an organisation's strategy. De Tijd, 2006, defines BI as all applications supporting analysing and reporting of corporate data in order to improve decision making which leads to better steering of the company. Decision makers need to be provided by reliable information, filtered from all raw data the company has acquired in the past. The main purpose is to transform these raw data into valuable, actionable information. Common transactional software automates daily based processes such as the creation of invoices and registers them into the system. Unlike this, BI sets a step backwards to provide a holistic view on these transactions. Figures from the past are not reported in a very detailed way, in stead they are aggregated, analysed and linked to each other with the purpose to forecast future activities.[5] Also David M. Kroenke, 2006, mentions business intelligence systems fall into these broad categories, namely reporting, including OLAP, and data mining. Aronson, Liang and Turban, 2005, also

[4] http://www.gartner.com/Init

[5] http://www.tijd.be/ondernemen/business_intelligence

divide BI tools into reporting, OLAP and data mining. In this chapter I will divide BI tools also into these 3 categories.

Apparently most of the definitions agree business intelligence should support defining the fundamental direction of a company by analysing and reporting data. In section 2.2 these categories are discussed more detailed.

2.2 BI Architecture

2.2.1 Operational Applications vs. Business Intelligence Applications

Figure 8 illustrates the 2 main components of BI applications, and their relation with operational applications. Notice that Kroenke, 2006, defines reporting and data mining as the 2 main BI components. In my opinion OLAP is situated anywhere between reporting and data mining. Therefore, in this dissertation reporting, OLAP and data mining are described separately.

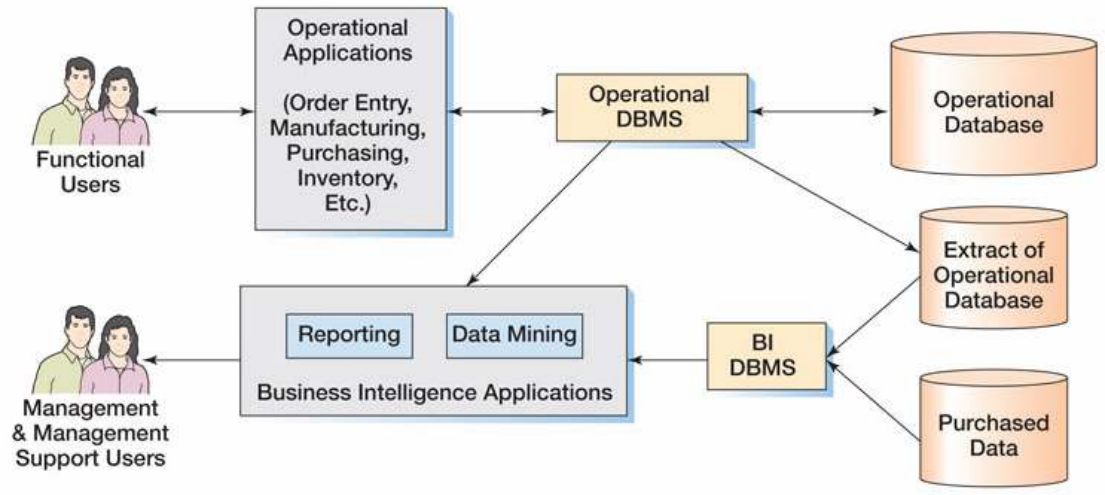

Figure 8 Relationship of Operational and Business Intelligence Applications (Source: Kroenke, 2006)

On the one hand, operational business applications such as order entry, manufacturing and purchasing read from and write data to the operational database via the operational database management system (DBMS). Entering orders for example into a corporate system is mainly situated on a company's operational level and do not mainly require

high level decisions to make. According to this scheme, management, situated on tactical and strategic level, are supposed to rather use business intelligence applications to improve decision making. Notice that this distinction touches the core of this dissertation, as the main goal is to find out what corporate level(s) is BI really contributing to.

BI applications on the other hand might only read data directly via the operational DBMS from the operational database, as long as simple reporting and/or small databases are applied. Data from extractions of this operational database as well as purchased data from external data vendors are read through the BI DBMS. BI applications then can both make reports as well as carry out some advanced analyses based upon these data. In further paragraphs a more detailed subdivision of these components will be explained (Kroenke, 2006).

2.2.2 The Need for a Data Warehouse

For complex BI applications running on large databases difficulties might occur while reading directly from the operational database. Besides slowing down the DBMS and its applications, errors might occur when values are missing or in a wrong format. Therefore, a separate database, an extraction from the operational database, needs to be set up and prepared for BI use. This process of data warehousing is done in 3 main steps, also known as extraction, transforming and loading (ETL).

Extraction programs retrieve data from a variety of heterogeneous operational databases based upon a certain model. The metadata describes this model and the definition of the source data elements. For example, a model describing the regional sales performance is defined by metadata containing sales data in integer format created by salespeople of a particular region. Notice that using indexes improves the speed of this extraction process. Transformation of data is sometimes needed to ensure consistency of all data in the data warehouse. Data need to be transformed into the right format or missing values need to be filled in. Certain aspects of operational data, such as low-level transaction information, are also removed as they slow down query times. Finally the DBMS loads these processed data into a data warehouse. This process of extraction, transforming and

loading (ETL) is crucial in BI processes as they are the link to the source data. Once ETL has finished, users can start producing information or intelligence. Obviously, people preparing data warehouses are experts in data management. They consider the preparation of data warehouses as their final product. In contrast, from business point of view, data warehouses are only the beginning of a business analyst's job. People of marketing or financial departments might rather work with data marts. These are small subdivisions of data warehouses containing data on specific business components. The marketing analyst might for example analyse a data mart containing sales data of a particular market segment. Figure 9 illustrates how data warehouse DBMS links operational databases and BI tools graphically. Notice that metadata, data concerning the data's author, format, time of creation, etc., is also stored through the data warehouse DBMS (Kroenke, 2006; http://www.pcc.qub.ac.uk).

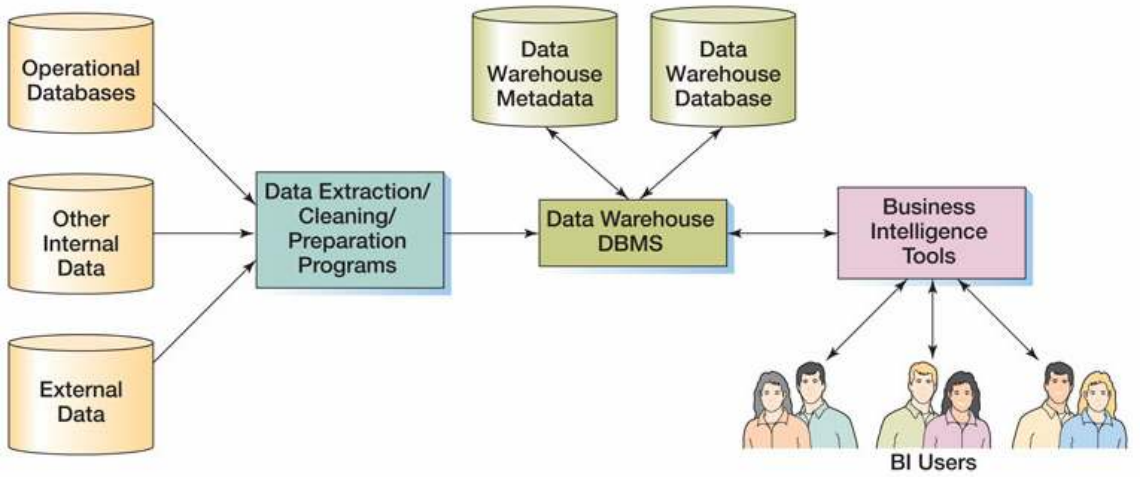

Figure 9 Components of a Data Warehouse (Source: Kroenke, 2006)

2.3 Analysis and Reporting: Improve Decision Making

2.3.1 Reporting

Reporting technology in BI contains much more functionalities than just distribution of information. Reporting is applied in business processes to generate reports for applications such as logistics and financial management. Based upon user skills, BI

distinguishes 3 main types of reporting tools, namely production reporting tools, desktop report writers and managed query tools.

Production reporting tools are used to generate operational reports or extremely voluminous batch tasks such as counting and printing salaries. Generating reports requires support form the IT department. As these reports cover large amount of data, queries are processed in batch mode.

In contrast, desktop report writers enable users to design queries and reports quite simply and easily on their desktop, without interference of the IT department. Via a graphical interface report writers have access to multiple databases, make selections out of them and present and distribute the results via a large variety of report formats. Figure 10 shows examples of different types of reports. Desktop report writers enable users to design quite simple reports, based upon a rather small pool of data. When complex source data need to be accessed, managed query tools are to be applied.

Managed query tools enable users to access complex source data on a fairly simple way. This combination requires an interface between the data sources and the user, which defines the relation between the physical data in the databases and the user language. This interface contains a graphical SQL environment generating the SQL code according to a graphical command. Standard Query Language (SQL) is a standardized database language for data access (read, insert, update, delete) and manipulation in relational database management systems (Aronson, Liang and Turban, 2005). SQL enables users also to carry out some simple calculations on data such as generating overviews of past (trends), current, and likely future business activities (forecasting) (Kroenke, 2006).

As a result of this user friendly interface, users can totally focus on defining questions without worrying about aspects such as the location of the data, consistency and the like. For example, an overview of total units sold per year, customer type and geographical area can be shown. Important to stress is this interface enables non-technical users to create their own customized reports. As in my opinion holistic overviews are very useful at high level management, this reporting tool might contribute a lot to a company's strategic management. Sometimes managed query tools provide

OLAP functionalities as well. OLAP enables users to further dig into the general overviews of managed query tools (Kroenke, 2006; http://www.cibit.nl). This is further explained in 2.3.2.

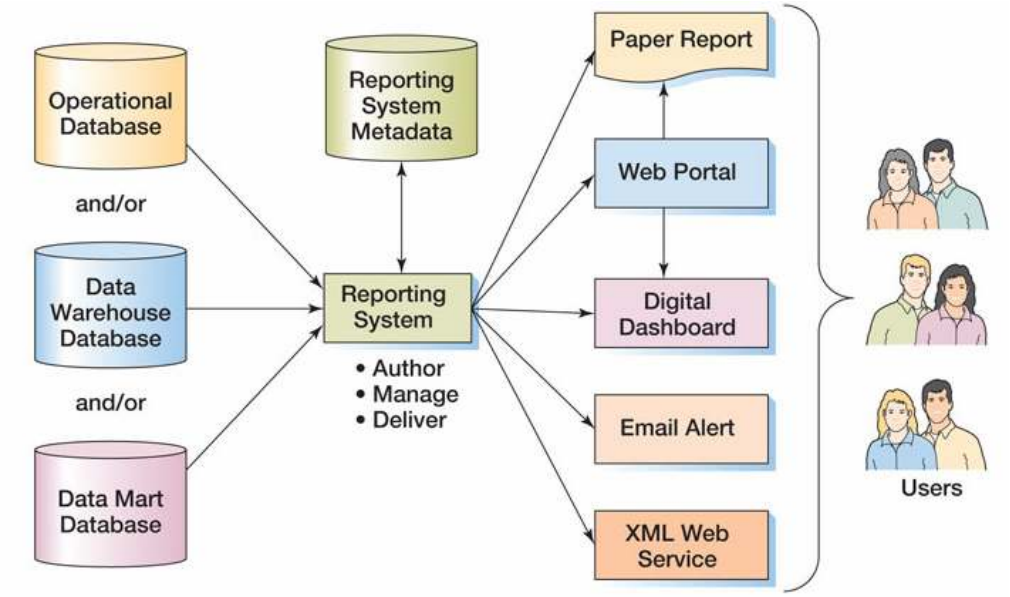

Figure 10 Components of a Reporting System (Source: Kroenke, 2006)

Report delivery and distribution is crucial in the decision making process. Reports need to be delivered to the right and authorized users, in the right format and on the right time. The report output might be delivered on paper, via a browser, over the telephone, or in any other format. Figure 10 shows both input and output components of a reporting system. A digital dashboard is an electronic customized display of the report (Kroenke, 2006). A financial analyst might for example prefer the company's financial stock price as well as European and American stock prices on his dashboard. Alerts are reports that are automatically triggered when an event has occurred, e.g. an e-mail is sent if the company's stock price has reached a predefined limit.

The RFM analysis is an example of such a report. This report ranks all customers based upon how recently (R) they bought something, the frequency (F) they buy, and how much money (M) they spent. This RFM technique enables users for example to identify clients tenting to go to competition (Kroenke, 2006). Although this is not a complex technique, it already unveils, in my opinion, extremely valuable intelligence for a company.

2.3.2 Online Analytical Processing (OLAP)

OLAP or Online Analytical Processing goes even further than managed query tools. Rather than a reporting tool, it is an analysis method providing insight into data through quick and interactive access to a large diversity of views on information. Defining OLAP is like adding 3 major characteristics to managed query tools, namely multidimensionality, hierarchy and interaction.

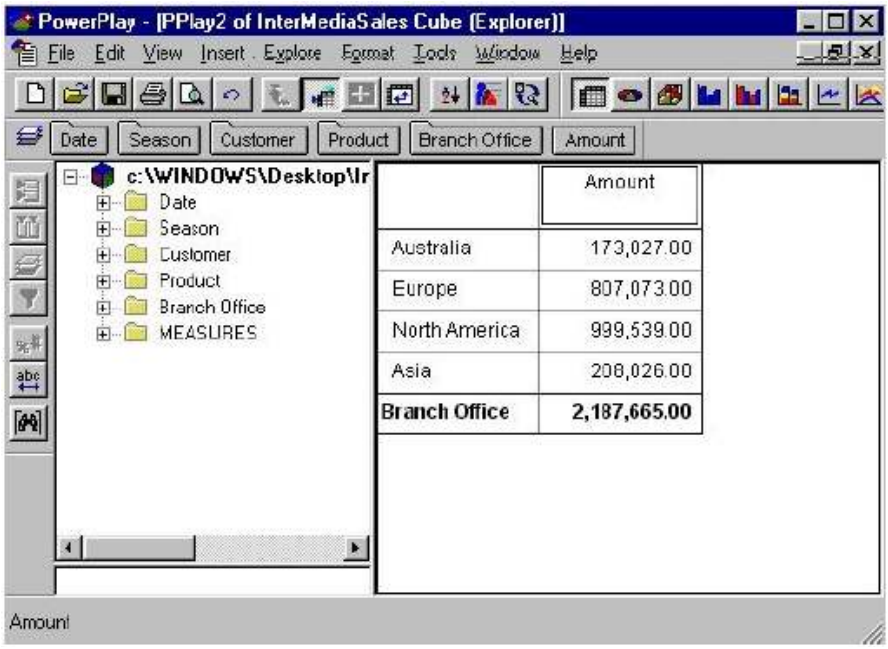

Figure 11 A 2-Dimensional OLAP Report of Amount per Branch Office (Source: http://www.cibit.nl, 2001)

One of the most useful OLAP characteristics is that reports might be viewed in multiple dimensions. Referring to the 3 dimensions of a cube, OLAP reports are often called OLAP cubes. Dimensions are considered as important perspectives, entities, or components of a measurement. Examples of dimensions in a sales report are location, time, customer, salesperson and total units. Sales in this report can be sorted or viewed based upon each dimension, depending on the preferences of the user. A marketing manager might for example prefer the report to be displayed with the dimension of market share first while a product manager would like to subdivide the report based upon product types. Figure 11 illustrates an example of a 2 dimensional OLAP report of

a yearly sales amount per branch office. This consolidated data is very useful to retain the holistic view of the company.

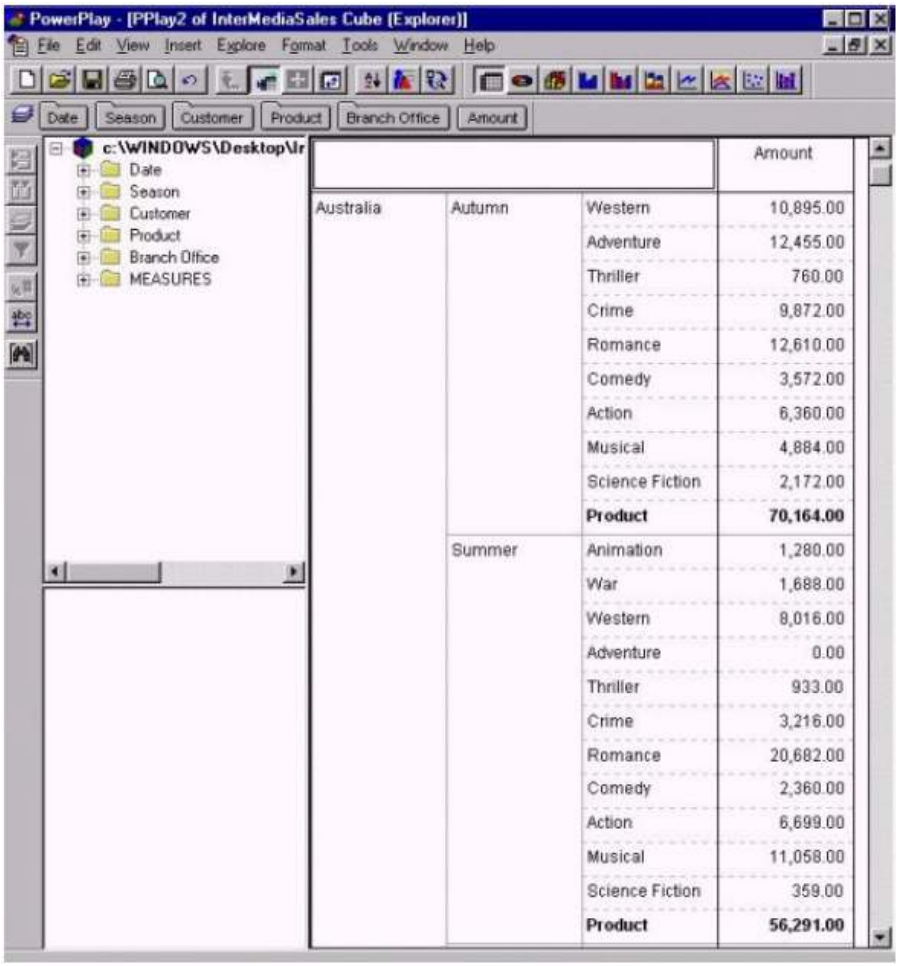

Figure 12 A 4-Dimensional OLAP Report of Amount per Branch Office per Season per Product (Source: http://www.cibit.nl, 2001)

But suppose the general manager wants to investigate in which season what kinds of products are sold in the Australian branch office. To add those 2 additional dimensions, the manager needs to drill down twice, both on product and season. Only the first part of the complete reports is shown in figure 12. Notice that adding dimensions splits the data into more detail. In other words, users can drill down on each dimension, or subdivide them into more detailed levels to figure out a particular value of this dimension. Dimension ‘time’ for example can be subdivided into year, season, quartile, month, week, day, hour, and minute. Similarly, drilling up refers to aggregation of data

into less detail. Aggregation or drill up provides the possibility to retain a clear and holistic view on large amounts of data. This aggregation requires simple calculations such as sum, average, and the like. Because of these simple calculations Kroenke probably categorized OLAP as a reporting tool. In my opinion OLAP is much more than reporting and deserves a separate section. As one can see, hierarchy of dimensions provides crucial functionalities to OLAP reports.

These 2 characteristics illustrate the possibility of interaction between users and OLAP reports, which is a third characteristic of OLAP. Thanks to this dynamism, OLAP reports are very much liked by its users. A few mouse clicks enable users to slice and dice data while observing graphs and tables reflecting the selected dimensions. (Kroenke, 2006; http://www.cibit.nl). Depending on the vendor, OLAP capabilities might be integrated into the World Wide Web. Figure 13 shows an example of a visual representation of a Web-based OLAP sales performance report sorted by geographical area (http://www.sas.com).

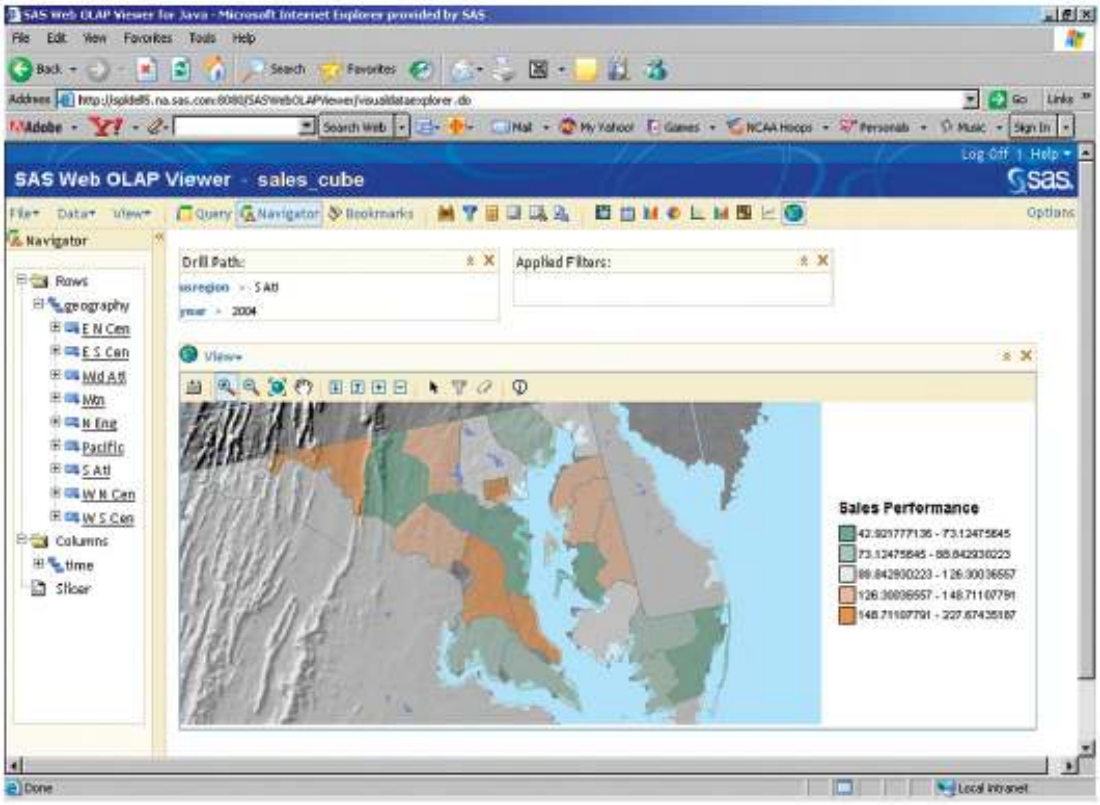

Figure 13 Example of Web-based OLAP interface (Source: http://www.sas.com)

2.3.3 Analysis: Data Mining

SPSS Clementine 9.0 is an enterprise data mining tool and defines data mining as

"… a variety of techniques identifying nuggets of information in bodies of data. Data mining extracts information in such a way that it can be used in areas such as decision support, prediction, forecasts, and estimation."

Figure 14 gives an overview of the main disciplines data mining is covering. Highly sophisticated business analyses require complex statistical and mathematical techniques. But because of their difficulty to use these techniques require very experienced professionals, often active in marketing or finance departments. The combination of these experts' knowledge and advanced analysis techniques should guarantee data mining successes. Historical data is used to generate models that are used for prediction or other pattern identifications. The technique for building these models is often called machine learning or modelling. To ensure this historical data is reliable and extracted in a consistent way huge databases are set up and maintained by data management systems. Data mining covers all these previous domains supporting finding patterns and hidden relationships in data.

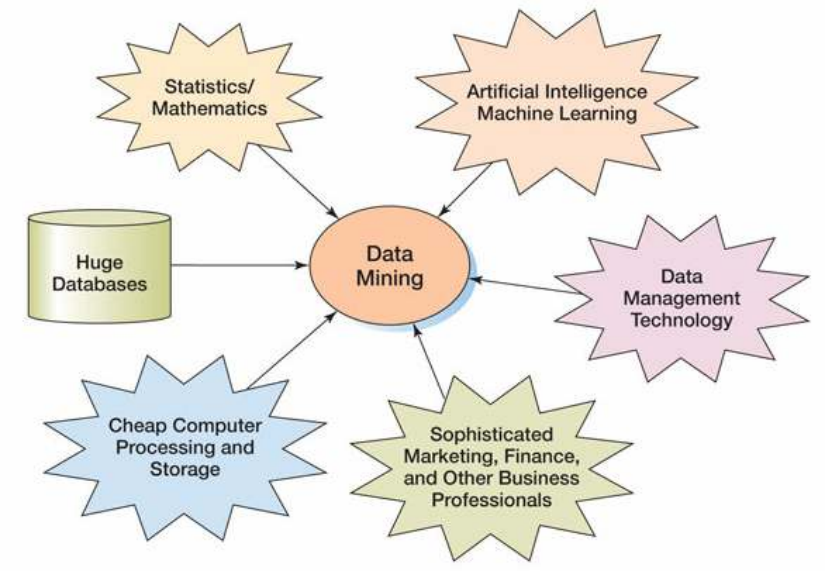

Figure 14 Data Mining Disciplines (Source: Kroenke, 2006)

Barko & Nemati, 2001, defined 3 types of methods used to identify such patterns and relations in data:

- Simple models (SQL based queries, OLAP)
- Intermediate models (regression, decision trees, clustering)
- Complex models (neural networks)

These patterns and rules can be used to guide decision-making and forecasting the effect of decisions (what-if analyses). Notice that also OLAP could contribute to the design of simple models. For intermediate and complex models more sophisticated data mining methods are indispensable. Based upon these methods descriptive and prediction models are designed. Notice that prediction models rather focus on the actions following out of the insights gathered from descriptive models. However, there is no clear distinction between both models. For example, sending product samples to new, potential customers is done based upon a predictive model, while classifying different customer profiles is supported by a descriptive model. Both models could be designed by the same classification technique. Each data mining method is supported by a set of algorithmic approaches to extract the relevant relationships in the data. These approaches differ in classes of problems they are able to solve. Haskett, 2000, defines 6 classes which are discussed below.

2.3.3.1 Classification

Classification defines the main characteristics of a certain group according to past history. For example, classification could design a profile of customers which were lost to competition. Decision trees and neural networks are very often used techniques for classification. Below the general concepts of decision trees and neural networks will be explained.

Decision trees divide data into relevant classes in order to create insight in existing and future data. For example, a bank might build a tree that classifies which existing customers were approved to get a credit in the past based upon income, balance and debt rate. This decision tree could provide insight which factors contribute to the approval of the credit. Based upon this model, (business) rules can be induced for the

approval of credits. These rules are used to decide whether or not a new customer is approved to get a credit. Figure 15 illustrates an example of a decision tree based the example above. As you can see, the algorithm discovers 'income' is the primary factor to approve credits. 5 out of 6 high income clients got a loan, while all 5 requests of low income clients were rejected. Income is apparently an important predictor for banks to check credibility. A request of a new client first requires checking income. When low, the request can be rejected immediately, while a high income could require any further investigation.

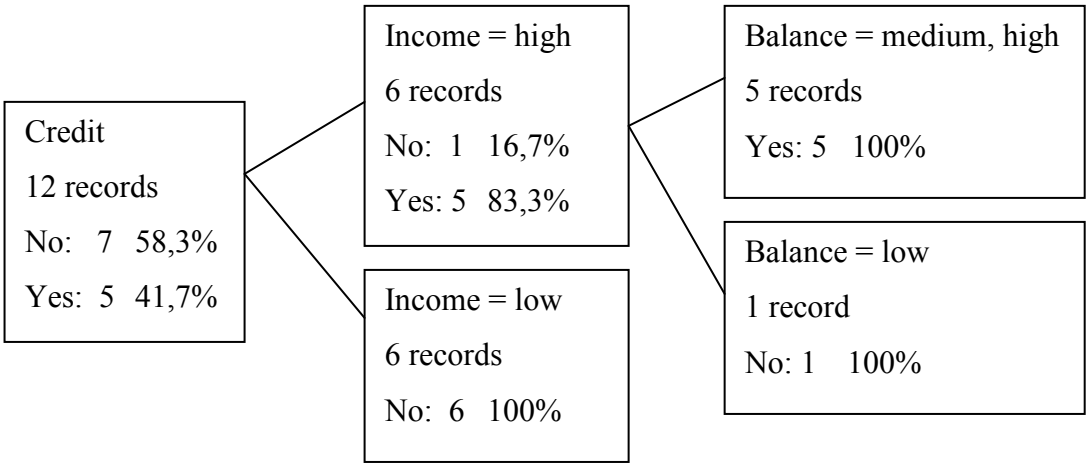

Figure 15 Decision Tree (Source: http://www.cibit.nl, 2001)

An artificial neural network is a simplified model of human nervous system. The basic units are neurons, which are structured in 3 main layers, as shown in figure 16.

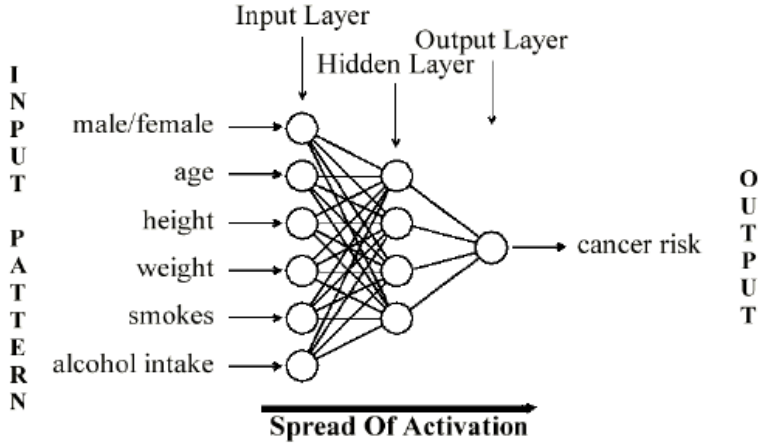

Figure 16 Neural Network Structure (Source: SPSS Clementine 9.0 Manual, 2004)

Neural networks are able to relate hundreds of input variables to a goal variable which at first sight doesn't seem to be associated with any of the input variables. In the example below the neural network finds a connection between 'innocent' variables such as age and height to the risk of cancer. Examining each record the network is able to learn and to identify (hidden) patterns between those neurons. Once trained, the model can be applied for new cases with unknown outcomes. Therefore, neural networks are very useful for predictions as well.

2.3.3.2 Clustering

Clustering identifies groups (e.g. customers) sharing the same characteristics. Clustering differs from classification as it does not predefine these characteristics. Clustering algorithms support for example segmentation, which is a marketing method identifying classes of customers with certain needs. Figure 17 illustrates an example of a clustering model of car brands. Suppose analysts have obtained ratings based upon 2 variables of 1000 interrogates on several car brands. Variable x refers to a car's price while variable y refers to a car's sports image. Data mining helps analysts processing, identifying and mapping the different clusters. As you can see in our example, 3 main clusters are defined by the algorithm.

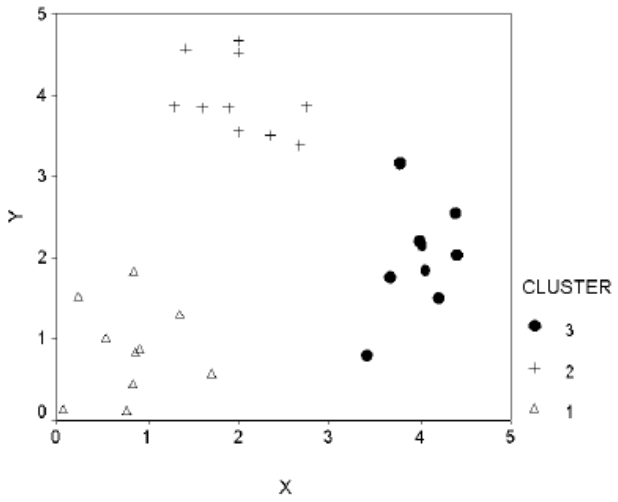

Figure 17 Cluster Analysis (Source: SPSS Clementine 9.0 Manual, 2004)

2.3.3.3 Association

Association identifies relationships between 2 events at one single time. Analyses such as market basket analysis are solved with this approach. A market basket analysis identifies the products customers are likely to buy at the same time. Statistical methods are very often used in order to obtain this association. Figure 18 shows an example of a market basket analysis. For example member cards in super markets obtain data from all members. Using data mining association methods analysts can easily investigate which products are purchased together. In our example the analysis software discovered a pattern between beer, canned vegetables and frozen meals. Analysts may conclude they are very likely to be bought together.

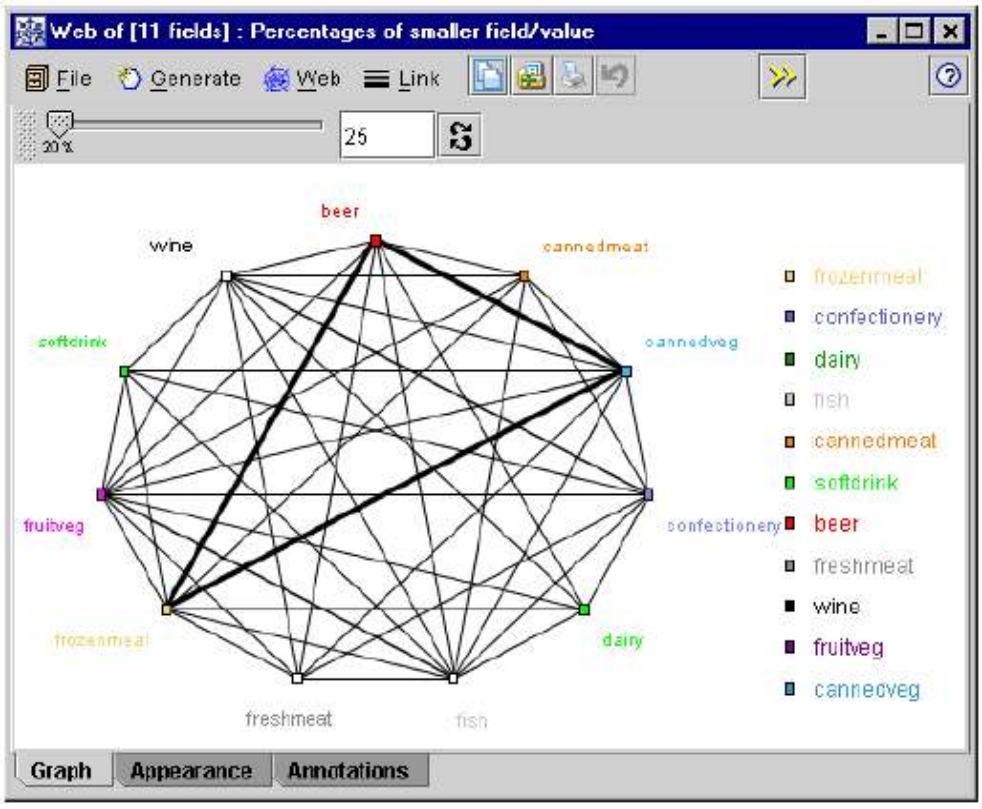

Figure 18 Market Basket Analysis (Source: SPSS Clementine 9.0 manual, 2004)

2.3.3.4 Sequencing

Sequencing identifies relationships between 2 events over a long period of time. Unlike association, sequencing requires repetition of events in order to involve the time aspect. Like association, member cards, account numbers or other means are used to track purchases of member customers. Analysts might for example consider a certain client's buying behaviour during 6 months. If during the last months the amount of purchases has significantly reduced compared to the initial buying pattern, the company might react and send a (customized) present to give the client an incentive to increase purchases again.

2.3.3.5 Regression

Regression estimates a relation between one dependent variable and multiple independent variables. This estimation is based upon large sets of data in the past. Moreover, based upon these historical scores of independent variables, one can predict or estimate future scores of the dependant variable as well. For example, sales quotes depending on thousands of factors such as weather, customer confidence, and price can be easily predicted using regression. In other words, regression is a useful technique to forecast demand or to map trends.

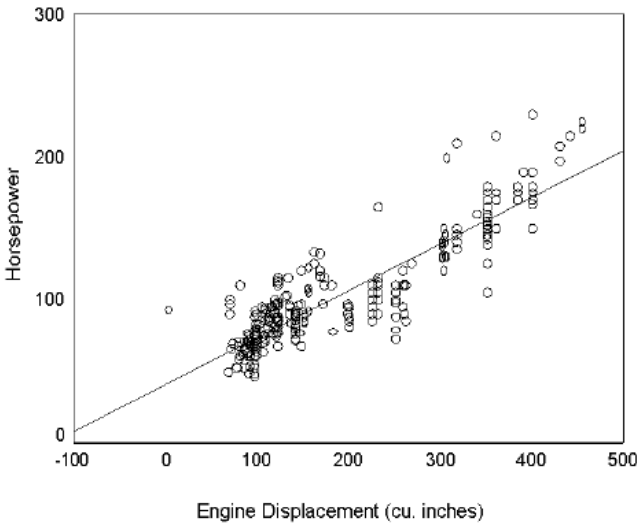

Figure 19 Linear Regression Model (Source: SPSS Clementine 9.0 manual, 2004)

Figure 19 illustrates an example of linear regression between a car's horsepower and its engine displacement. The linear relation can estimate a car's horsepower when you insert the engine displacement of that particular car. Notice that this regression model is much more accurate for values of about 100 inches than for values of about 400 inches. This data mining technique can carry out what-if analyses and predictions, and might contribute to facilitate decision making as well. Notice that this technique might support the scenario analysis which was discussed in 1.4.3.

The results of data mining analyses are also often visually displayed in graphs or charts. The distribution of the outcomes is usually incorporated into other (OLAP) reports, as they are quite often just passing the essential or analysed parameters. In the case of the buying behaviour, only the related clients and products need to be delivered to the marketing department, who might for example send these clients discount vouchers for products they didn't buy yet (Kroenke, 2006; Aronson, Liang and Turban, 2005).

2.3.4 Data mining applications

Besides time reduction, data mining offers lots of other sophisticated analysis which go much further than any OLAP report. Thanks to this complexity data mining results provide often very detailed and useful answers to fundamental business questions such as:

- Who are our most profitable customers and what is their potential?
- What kind of customers needs what kind of products?
- What kind of customers will leave to the competition in the future, and why?
- What risk do we have to manage by servicing certain customers?
- What products are bought together?
- What products are bought by similar customers?
- Why are sales higher than expected? Is the driving force a particular product, region, or customer or any combination of these?
- Why are shipments not executed as expected? Is the bottleneck due to stock problems or production problems?

- Why is market share lower in the south then in the east? Is the problem due to regional customers, distribution channels, or our sales team?

These are example of questions which might contribute to several data mining applications (http://www.cibit.nl). Below some typical applications of data mining techniques useful in business are described. Notice that data mining application reach much further than only market analyses (Aronson, Liang and Turban, 2005; SPSS Clementine 9.0 Manual, 2004).

- **Direct mail** is an application which determines demographic groups with the highest response rate. This actionable information can help to maximize the response of future mailings.
- **Credit scoring** was already discussed while describing decision trees and classification. Historical data are used to facilitate future credit decisions.
- **Human resources**: like credit scoring, it might be interesting to understand past hiring activities. Decision rules can be defined to formalize the hiring procedure and to rationalize hiring decisions.
- **Market analysis** determines which factors, such as geography and customer characteristics affect sales. Other marketing examples are market basket analysis and market segmentation (clustering) which are illustrated above.
- **Quality control**: based upon historical manufacturing data all variables causing defects can be tracked.
- **Risk assessment**: decision trees or neural networks could classify relevant future situations in such a way that one is able to calculate the risk of certain scenarios.
- **Inventory control**: once a reliable estimation has been defined (using regression), managers can steer variables in order to retain an optimal inventory.
- **Sales forecasting**: methods such as regression can estimate and forecast sales based upon undependable factors.
- **Customer life cycle analysis**: sequencing is used to draw an image of certain clients buying behaviour. As a consequence one might estimate the potential of clients. Is a client situated in the growing phase, or has he already been saturated?

- **Interest rate prediction**: like inventory control, once undependable variables are defined, regression techniques are used to forecast interest rates. Management could postpone heavy investments to periods marked by low interest rates.

As you can see data mining could be applied in business in many ways. Moreover, these applications could heavily affect decisions both on high and low level management.

2.4 Conclusion

In this chapter we defined the main components of business intelligence systems. Reporting tools focus rather on the distribution and visualisation of generalised data or information. Nowadays report creation and distribution means are tending to be more user-friendly. With a few mouse clicks users can easily design their customized reports. OLAP reports are even more advanced by adding useful functionalities to reports. Users are able to slice and dice data highlighting all relevant dimensions they are interested in. Data mining tools really are data miners as they are able to discover (hidden) patterns and relationships in data. We have seen very useful business data mining applications which could affect the decision making process. In the next chapter I will align this chapter with the first one in order to measure the level of contribution of BI tools to strategic management.

Chapter 3 BI vs. Decision Making

In this chapter the 2 previous chapters will be aligned. First of all I will check to what extent BI tools of chapter 2 cover the needs of decision makers in organizations in section 3.1. Secondly I will check to what extent BI tools or applications match Herring's Key Intelligence Topics and the strategic management techniques described in chapter 1. This is done in sections 3.2 and 3.3 respectively. In other words, the contribution or relevance of BI tools to strategic management will be measured.

3.1 BI Audience

Economic environment has always been characterized by increasing revenues and decreasing costs. Managing costs and revenues covers much more than just dealing with financial aspects of these terms. In order to obtain competitive advantage companies need to react faster than competition, take more environmental issues into account, manage information sources efficiently, and many more. These parameters are just a grasp of all others needed to be managed. Today's revenues are very much influenced by the speed and efficiency of decision making while today's costs are by the consequences of digitization of information. Nowadays, companies deal with growing amounts of data which increases organizational complexity and subsequent costs. In perfect competition, managing these problems is one of the only important ways left to gather competitive advantage.

As you might have noticed in the previous chapter, BI provides a large variety of services which are applicable in some of the above issues, from top level management to line management. However, in my opinion, different management levels have different information needs. Figure 20 illustrates the traditional management pyramid which distinguishes also 3 main corporate levels to divide corporate responsibilities of top managers, middle managers and line managers. This pyramid is useful to apply the different BI services to strategic, tactical and operational level. For each level information requirements are different in terms of usage frequency, time horizon, accuracy, and the like.

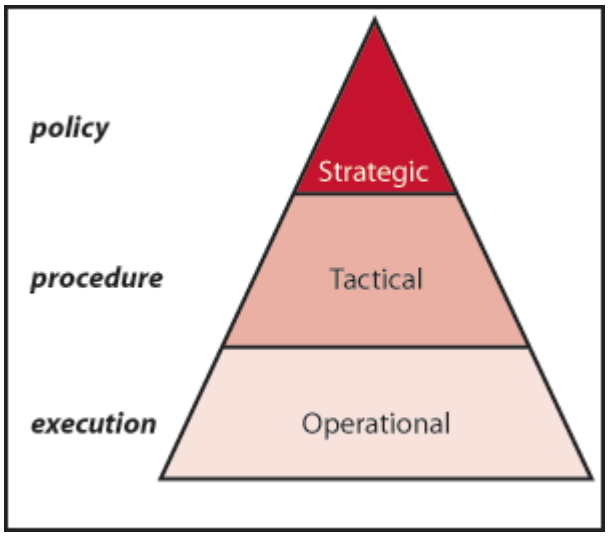

Figure 20 Management Pyramid (Source: http://www.dmreview.com/article_sub.cfm?articleId=1002442)

3.1.1 Strategic Management

Executive decisions at strategic level have a quite big impact on the rest of the company in the long term. Because of this impact on multiple departments and functional levels, these decisions take place less frequently then tactical or operational short term decisions. Examples are entering a new geographic region, delocalization decisions (http://www.fairisaac.com/fairisaac).

In order to take these strategic decisions top executives need consolidated and aggregated information about all kinds of business activities. Top managers mostly don't focus on particular issues, instead, they are considered as captains on a ship indicating the right direction. They deal with a large variety of parameters and shift speed and direction to conquer the wildest storms or indicating the nicest directions. Similarly, top executive managers should preserve their helicopter view and are required to take all parameters into account to discover possible future threats or nice opportunities. Top executives should always carry the binoculars in order to monitoring all essential activities. Besides monitoring these essentials, top managers need also gathering insight into drivers of particular tendencies behind aggregated data. This insight contributes to understanding the reasons why strategies succeed or fail. The

faster this insight can be revealed, the faster decisions can be taken. But to gather this insight and to understand the drivers behind data top executives should occasionally dig further in data into detail. In my eyes this digging or drilling down is indispensable for understanding and anticipating on similar future scenarios. I am quite confident BI software is able to provide a solution for all of these kinds of issues.

Consolidated data such as trends, production overviews over time, historical evolutions of market shares and the like can be easily retrieved by reporting tools. In this point of view reporting, which I consider as the most simplistic BI functionality, fulfils already an important strategic information need. Monitoring all anomalies, opportunities, threats, or other essential parameters is done by data miners, which function on the tactical level. Market segmentation, demand forecasts and other data mining applications discussed in 2.3.4 are just examples to illustrate the importance of the results which are indispensable for strategic management. I think the most efficient way to communicate these often staggering and unexpected results is to integrate them into reports to the top level management. Digging into data, or drilling down in detail on aggregated data refers obviously to the OLAP BI functionality. As a consequence, which is explained above, this OLAP tool can easily contribute to gathering insight in large amounts of data when efficiently used. Furthermore, I would like to mention the importance of user friendliness of these tools. Besides, top executives need to be provided quickly and easily as they don't have time to master complex software.

As you can see, BI tools could actually contribute a lot to strategic management in theory. Nevertheless, just the existence of functional BI capabilities unfortunately is not a guarantee for the right translation into strategic planning or management. Therefore some glue between these 2 pillars is needed definitely. BI information results should be matched against predefined and measurable objectives set by the executive management. The parameters used for the creation of relevant objectives and for analysis of reaching goals are often called key performance indicators (KPI's).[6] In other words, a scorecard tool is needed to help executives indicating the right strategic decisions to take. The balanced scorecard is an example of such a measuring and management system and is illustrated in figure 21. This system translates the corporate

[6] http://www.12manage.com/methods_rockart_csfs_kpis_nl.html

vision and strategy into action, actionable information, or intelligence. Both internal and external business activities are provided feedback to continuously improve strategic performance. The balanced scorecard is in fact considered as the driving wheel of a company and consists of 4 main perspectives a strategic manager should face his company.

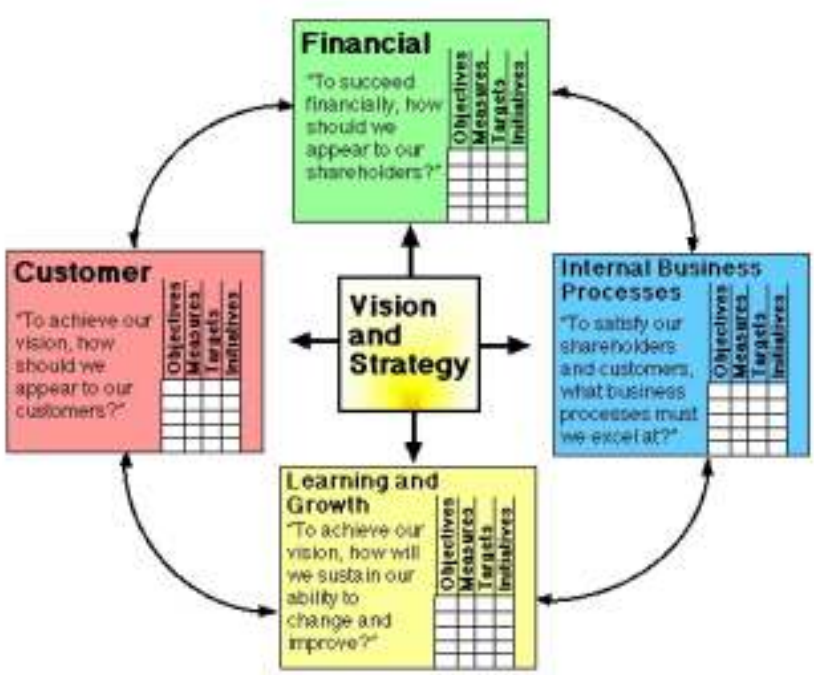

Figure 21 Balanced Scorecard (Source: http://www.balancedscorecard.org/basics/bsc1.html)

Measurements concerning internal business processes allow managers to monitor current or past businesses and whether they cover all required and predefined customer needs. Indicators such as customer satisfaction, market share, and production duration are very easy to calculate via BI tools as explained above. The tricky part of this story is to predefine objectives in advance and to steer when things go in a wrong direction.

Measurements concerning customer focus and customer satisfaction are quite related to internal business measurements. In this perspective we measure the customers' satisfaction and feedback which is very important for the future company image. Indicators such as customer satisfaction can easily be measured by all kinds of customer surveys. Market basket analysis is an example of measuring customer satisfaction in a

certain point of view. This illustrates again that assessment data can be easily transformed into usable, quantitative and measurable metrics.

Financial measurements are a very traditional need to managers because the financial situation is still the most important driving factor behind businesses. All kinds of financial ratios such as return on investment (ROI), profitability and current ratios are also very easy to define and can be reported with a few mouse clicks.

Finally, measurements concerning the company's (employees) learning and growth are in my opinion the most difficult to define properly. This measurement indicates a company's very long term vision and commitment to continuously growing through learning. Nowadays, knowledge management is getting increasingly important in Western Europe. Therefore, I think strategic executives, especially in consulting companies, should pay special attention to this perspective. In knowledge-based businesses like this continuous learning is sometimes considered to be a guarantee for sustainable growth. Indicators such as number of relevant, emerging trainings followed by each knowledge worker can for example be targeted to a fixed amount.[7] Catching up emerging technologies should be tracked first in order to be able to measure and manage them. As this process of discovering and tracking emerging technologies requires always a human factor, BI can only contribute starting from the moment these technologies have been identified.[8]

3.1.2 Tactical Management

Tactical decisions refer to short term or daily based decisions. They occur more frequently than strategic decisions but they can be considered as sub-decisions supporting the long term strategic ones. Tactical decisions affect mostly one specific department as the scope of the data used is much more specific than in strategic decisions. Examples are decisions concerning what products are offered to customers in

---

[7] Peter Drucker first used the term 'knowledge worker' in 1959 and refers to anyone working at the tasks of developing or using knowledge (Drucker, 1959).

[8] http://www.balancedscorecard.org/basics/bsc1.html

which segments. Another example is defining the maximum risk a company can afford for granting credit scoring to customers (http://www.fairisaac.com/fairisaac).
Users at tactical level of a company have the responsibility to meet specific objectives in short predefined term. Business managers make decisions concerning what specific course to take, or what to focus on for the next few months for example. Knowledge workers analyse data and make trade-offs regarding allocation problems, and decide intervention of external consultants for example. Both business managers and knowledge workers are much more involved with the analytical part of data processing. More than strategic executives they should understand the driving factors behind data in a much more detailed level. Because of the short time horizon, they should be able to react fasten on dynamic changing environments. Therefore, business managers and knowledge workers should dispose of advanced analysis techniques, which can be provided by data mining. Credit scoring, segmentation, risk assessment, inventory control, and most importantly understanding causes of particular tendencies are typical data mining functionalities. Notice that some of these tools are quite complex. Therefore, today's knowledge workers or data analysts still need to dispose of very technical skills. Nowadays these highly educated and specialized profiles are scarce and expensive resources for companies. Therefore, improving user friendliness of data mining tools could facilitate the accessibility for all users who need them. As discussed above, on the other hand, incorporating results of complex analyses could be reported to people who need them (http://www.proclarity.com/).

In other words, data mining tools provide solutions for both short term tactical decisions and long term strategic decisions. Regression analysis, causal relationships, and forecasting are perfectly feasible in short term as well in long term. In the first case results are directly accessible by business managers or knowledge workers. In the latter case, results of complex analyses should be reported to strategic executive level. Nowadays, as you can see in the next chapter, this reporting functionality is often integrated with all other BI functionalities.

3.1.3 Operational Management

As you can see in figure 21 operational level employees are responsible for execution of daily tasks. Operational decisions are very voluminous and they deal with individual transactions.
The information or data needed to support operational decisions is very much focussed on a particular topic, such as a copy of an invoice, without any advanced analyses. Reports providing for example all products to be shipped that day, or (real-time) monitoring of inventory amounts are tasks every operator should be familiar with. Also at this level BI facilitates the way of working by automating the generation of predefined reports. Operators can easily monitor any kind of real time data thanks to a digital dashboard, which is described in the beginning of chapter 2. As reporting tools at this level do not require any complex analysis, they are considered to be very user friendly (http://www.proclarity.com/).

As you can see to each of the 3 main organizational levels BI provides in a certain way some contributions. At strategic level reporting and OLAP are indispensable for managing the balanced scorecard and the organization. Moreover, data mining results can be incorporated into reports and be provided to strategic management as well. Experts carry out all kinds of advanced and complex analyses at tactical level thanks to data mining tools. Finally, operators have less administration thanks to automated reporting tools. In this section the contribution of BI tools was matched to the 3 organizational levels in general. In the next section the contribution of BI functionalities will be matched to more strategic intelligence needs which were defined in chapter1. In section 3.2 the Key Intelligence Topics are matched to BI functionalities.

3.2 BI vs. KIT's

In chapter 1 we described Herrings' 3 main categories of intelligence needs. During many years of experience Herring found out that implementing and translating this intelligence continuously and properly to actions could result into healthy strategy and sustainable competitive advantage. In this section will be checked whether and what

exactly could be the contribution of BI to the provision or production of these three categories.

3.2.1 Strategic Decisions & Issues

The first 4 items in Herring's list are all about formulating future global company and industry scenarios. The definition of competitive environment is in my opinion an activity which should be carried out by human brains but which can be supported by BI tools in a certain way. When putting all intelligence resources such as demand forecasts, production planning, environmental research, and analyses such as SWOT analysis, Growth/Share Matrix and scenario analysis together I think only a few rational directions are left to choose.

Formulating the global competitive strategy refers to anticipating on forecasts in such a way to bypass competition. Scenario analysis based upon risk assessment sounds a good solution to map this problem. Notice that risk assessment is a data mining application based upon neural networks and could provide useful information concerning the likelihood or risk of certain scenarios.

"Global" definitely refers to aggregated or consolidated data. Market developments and industry globalization can also be analysed by a combination of scenario analyses and aggregated data. Aggregation of data can be provided by OLAP or reporting tools, while scenario analyses easily can be supported by a combination of several data mining tools such as regression analyses, decision trees, and neural networks. The 2 latter are often used for risk assessment applications. Assessing the role of competitors or other stakeholders in this plan can be performed by assessing each possible scenario in this scenario analysis. Assessment in general can be analysed through marketing research surveys or extrapolation of former assessments.

Strategic investment decisions, taking environmental changes into account, can be simulated by scenario analyses as well. Interest rates are one of the significant investment parameters. Therefore, interest rate prediction, which is also a data mining

application, could be performed for several (global) areas. Other financial ratios can easily be calculated via other data mining or reporting tools.

Expanding current production capacity or building a new plant is also a typical story one can put into a scenario analysis. Each component of such a scenario can be subdivided into smaller problems and can be solved by other data mining techniques based upon neural networks or forecasting. As you can see, data mining techniques do really contribute to strategic long term thinking by providing small parts of the big solution.

To preserve technological competitiveness I also refer to 3.1.1 where I briefly described or stressed the importance of continuous learning and growing. BI reports for example easily can track easily the number of relevant trainings to each knowledge worker. The results of this report should be matched against the predefined objectives in the balanced scorecard. Similarly I think technological competitiveness can be measured via BI reporting.

Identifying and assessing competition or other technologies also require sometimes human intervention. Identifying other technologies can be tracked by computers only when they are already introduced in the market. For example when indicators or ratios indicating to a certain number of existing technologies are declining significantly, data miners could easily discover another, probably new technology was introduced. These ratios are quite simple to calculate once you have the data. Therefore external support or provision from data suppliers can provide in some cases very valuable information. Anticipating on new technologies on the other hand is in my eyes only possible with human intervention. Regularly investigate in the existence of new technologies, or developing own technologies are still human actions or decisions only human can decide upon. As mentioned before, assessment of technologies can be analysed through market research surveys or extrapolation of former assessments. Results of these surveys can be processed by data mining tools and reported to anyone who needs them.

The last 2 items of this first list also deal with assessments and future scenarios of stakeholders and are similar to previous items which were discussed above. Therefore, I refer to previous items for further explanation.

3.2.2 Early-Warning Topics

The first 2 items, technological breakthrough or technological developments affecting the business was already more or less discussed in the previous paragraph. As I said, I cannot image BI tools or any other computerized tool could ever detect possible breakthroughs fully independently from human interventions, it remains in my eyes a human process. Once introduced in the market, scenario analyses, risk assessment, and regression analyses could easily determine or forecast the use of these technologies in different scenarios.

Intelligence concerning status and performance of key suppliers is very valuable when a company might be strongly dependant of them. If data is available for example via external sources, there is no problem to figure out what the exact situation of suppliers is. Financial ratios determining supplier's financial health such as liquidity, profitability, and many more are easy to define and to track via data mining or reporting tools. Quality problems also can easily be checked as quality control is one of those useful data mining applications based upon regression analysis. Parameters affecting defects are easily discovered and depending on their importance, a company could assess the importance of their supplier's general quality problems as well. Possible joint ventures (JV) or mergers and acquisitions (M&A) of suppliers could tremendously change relations and division of power of some key players. A possible explanation why they occur in some cases is due to one of the players' financial situation. As explained above already, these ratios are easily calculated and reported. Whenever the book value of a firm is much lower than the market value, this company could be an easy victim for external parties. In such as case, a JV or M&A could occur by an external party. The financial ratios are easily calculated and reported, it is a matter of monitoring them and perhaps putting them in a scenario analysis. The same story goes for JV or M&A among all other stakeholders. I would like to mention that in many cases financial data about any stakeholder is not always readily available. BI tools only support these kinds of analyses if data are available, reliable, and complete. Therefore, external data vendors could provide very valuable information in some cases.

Changes in external regulatory issues, industry procurement policies or processes, international political, social or economic situations, entrance of new players into the

market are in my opinion all of one and the same type. It is very difficult to discover or even to manage these external factors. A combination of scenario analyses and forecasting could possibly provide a solution to map some of them. Beside this, I am confident BI couldn't contribute in another way. Some activities such as terrorist attacks are simply not always foreseen. Interpersonal relations or secret inside information is sometimes the only source of information we can rely on.

3.2.3 Key Players in the Marketplace

As already mentioned above, providing intelligence concerning external parties could be very difficult or even impossible when no appropriate data is available. When no direct relation exist between external parties and a company external data is indispensable to carry out complex analyses. But when external parties directly affect a company's business processes, retrieving data directly is much more facilitated. Also publicly traded companies are forced to publish lots of inside information, especially financial information, to the outside world. As a matter of fact, the more data is available the more complex analyses, for example based upon neural networks, deliver exact results. Less data refer automatically to more general, intermediate analyses which could be associated with general overviews over long periods of time, or with models consisted of more estimated variables which could result in less accurate results. Nevertheless, providing intelligence concerning key players in the marketplace is technically sometimes similar to techniques providing the previous types of intelligence needs.

Profiling customers, competitors, or other stakeholders, they require data mining techniques such as classification or clustering. Clustering methods, explained in 2.3.3.2 used for segmentation is a very useful technique to create profiles. Notice that these data can only be retrieved by monitoring past and current activities of those players. Publicly traded companies do have to publish information about strategic plans, organization, and key personnel, but in other cases it will remain highly secured. Only inside information or estimations concerning these kinds of topics could possibly contribute to scenario based profiles. In other words, in my opinion, BI could contribute to some extent in profiling external parties, but lots of conditions need to be fulfilled.

Similar to assessing new technologies and the relevance to the business, in-depth assessment of key competition or other stakeholders, assessment of future competitive environment, and the like is carried out based upon market research surveys or extrapolation of former assessments. All kinds of interviews or anonymous surveys on the internet are examples of such surveys which can be processed with SQL. Data mining techniques can for example create assessments based upon these data.

Identifying new and emerging competitors is also a situation of the same type as identifying new and emerging technologies, which was discussed above in both strategic decisions and issues and early-warning topics. Notice that market shares and other ratios can easily be calculated and tracked over time. A significant drop in market share ratio could be detected and explained. Was this drop due to existing or new customers, distribution channels, or recently entered competition? Once causal variables are known, management could easily steer certain activities. As you can see data mining techniques such as neural networks or regression techniques could solve several problems in a time by identifying correlations and causal factors of particular happenings. Results can obviously integrated into reports for tactical or even strategic management, depending on their importance.

3.3 BI vs. Strategic Analysis Techniques

In chapter 1 I referred to 3 popular strategic analysis techniques, which are often discussed in theory in academic institutes. As BI is considered to contribute to a company's strategy, I wondered whether BI could contribute to these specific strategic analysis techniques as well, and to what extent.

3.3.1 SWOT Analysis

As described in chapter 1 this technique consists of 2 major aspects in defining a company's strengths, weaknesses, opportunities and threats, namely the division in internal and external driving factors.

Referring to the examples of chapter 1, an expansion of present production capacity might result into an internal strength. The decision to carry out this expansion could be rationally supported for instance by designing a decision tree. In analysing the evolution of a particular product's market share, a neural network could unveil the relation that increased quality is the main driver for increased market share. I consider this outcome, namely strong product quality, as an input for a SWOT analysis as well. Also the ability to monitor and control inventory, assess risks of particular scenario's, analyse customers' buying behaviour, or predict interest rates could be in my opinion definitely support discovering (hidden) internal strengths or weaknesses.

Defining external factors is much more difficult because of the introduction of uncertainty or lack of information. As mentioned above, on the one hand some external factors such as detecting new customers or competition could be carried out thanks to data mining tools. Defining external factors which are already introduced into the market and quantitative measurable can easily provide inputs for opportunities or threats in a SWOT analysis. But, on the other hand, other factors such as technological breakthroughs will never be detected by any BI tool, as it requires human intervention.

Concerning the definition of both internal and external factors in a SWOT analysis, I think data mining is the most appropriate and supporting BI tool. Of course, a company's ability to properly report and monitor activities via OLAP could be an internal strength as well. Notice that the key intelligence needs could also be very important inputs to make SWOT analyses, but BI contribution to them was already discussed in 3.2. In chapter 1 I stressed the importance of applying this SWOT analysis to competition in order to improve competitive advantage. As I already mentioned above, BI tools could only contribute to anything whenever a sufficient amount of data is available, reliable and complete. Gathering inside, reliable and available information about external parties seems very difficult. Therefore, I think defining competition's both internal and external factors requires at least more human intervention, and lots of estimated values to make the analysis sufficiently valuable. The contribution of data mining in this case is quite similar to making a SWOT analysis for your own company, but in my opinion the role will be smaller and much more based upon predictions or estimations of certain variables.

3.3.2 BCG Growth/Share Portfolio Matrix

In contrast with the SWOT analysis, the BCG growth/share portfolio matrix consists of quantitative and predefined ratios. Products or strategic business units (SBU's) are rated on attractiveness, which is measured by market growth, and competitive position, measured by relative market share. The latter is measured by the business unit's market share relative to the one of its largest competitor in the industry. Because of their relatively simple calculations, market growth and relative market share are figures which can easily be calculated and monitored with a reporting tool. Moreover, I think when continuously monitoring (and visualising) those, a dynamic growth/share matrix can be created which could result in faster or anticipated investment or divestment decisions. The contribution of BI is quite obvious in this case as reporting tools can easily take care of calculation, visualisation, monitoring, and reporting of those variables.

3.3.3 Scenario Analysis

During this chapter, when discussing the key intelligence topics, I now and again referred to scenario analysis. This is not a coincidence, as I already mentioned in chapter 1 that key intelligence topics could be important inputs for designing a scenario analysis. BI tools could also contribute in producing this intelligence needed for scenario analysis. While concerning Schoemaker's design steps for a scenario analysis, it might be clear that Herring's 3 categories could also be relevant to providing intelligence.

Steps 2, 3 and 4, namely identifying stakeholders, trends and uncertainties, obviously refer to the early-warnings and key player intelligence needs. Identifying trends also refer to the first category of strategic decisions and issues. As mentioned before while discussing for instance the key players in the marketplace, identifying customers or competition can be easily carried out using the right data mining or reporting tools. I refer to 3.2 for further explanation. I believe reporting, OLAP, and data mining tools could contribute a lot to identifying trends. Graphs of general overviews of market shares, production units, or other external factors such as labour costs or stock prices

can easily be monitored by reporting tools. OLAP functionalities such as drilling down on extreme values or dimensions facilitate detecting problem areas or topics, and focussing more narrowly on the essence of the problem. So, drilling down could specify investigations much more detailed. Neural networks could for example unveil hidden relationships between these trends and huge amounts of other (external) variables. Once these (hidden) relations or variables have been defined, forecasting becomes much more accurate. Notice that forecasting is needed in scenario analyses to define multiple possible scenarios. The likelihood of each of these scenarios can be estimated very accurately via risk assessment, which is another data mining technique. Decision trees or neural networks could classify relevant future situations in such a way that one is able to calculate the risk of certain scenarios. Sales forecasting and interest rate prediction are other data mining applications contributing very valuable information the more variables are taken into account. Customer life cycle analysis, which identifies the customer's current and future buying behaviour, is also a data mining application which could affect future scenarios. All these BI tools, techniques and applications could contribute the design of any scenario analysis in their point of view. Notice that in this explication BI contributes in a top down way. Detecting general trends can be easily done by reporting tools. OLAP provides the ability to zoom in a little bit more to certain values or dimensions. Finally, depending on the type of scenario, data mining techniques could in some cases really specify a number of realistic and relevant scenarios. The next step to go is making decisions out of these scenarios, which is a pure human activity. Nevertheless, I think the contribution of BI has definitely improved and elaborated strategic thinking.

3.4 Conclusion

In this chapter the functionalities provided by BI tools were aligned with the intelligence needs of strategic management aspects defined in chapter 1. I will now briefly give an overview of the main conclusions.

In the first section I have figured out to what extent and to which organizational levels BI is a contribution to in general. The balanced scorecard was introduced as an alignment and measurement tool between BI reporting and OLAP tools and the 4 main

strategic and long term corporate perspectives. Tactical management rather gained advantage from data mining tools which contribute a lot to investigations and accomplishing mid term goals. Monitoring tasks and simple calculations of operational management are easily provided by a BI reporting tool.

In the second section I wondered to what extend BI tools could contribute to defining Herring's key intelligence topics, which were defined in chapter 1. Intelligence concerning strategic decisions and issues rather gained from reporting and OLAP tools, as they require more general information. Defining early-warning topics and key players in the marketplace was not always that easy because lots of detailed and sometime inside information was required. Nevertheless, concerning these 2 intelligence categories, I found out that many data mining applications and techniques could be very precious and valuable for companies as they sometimes unveil hidden or non-trivial relationships. I also mentioned reporting tools distribute and facilitate communication of these valuable data mining results.

In the last section I wondered whether BI could contribute to any of these strategic analysis techniques which I defined in chapter 1, namely the SWOT analysis, the BCG growth/ share portfolio matrix, and the scenario analysis. Considering the first one, especially due to data mining applications defining internal factors, strengths and weaknesses, was definitely much more facilitated than defining the external ones. Also creating a SWOT analysis for competition is tougher than I thought because of lack of information. Thanks to real time and online monitoring of reporting and OLAP tools, all parameters could be calculated very easily. Moreover, I am quite convinced these BI tools could add a dynamic perception to the BCG matrix. Finally, reporting, OLAP, and data mining tools facilitate all the scenario analysis design in many ways, starting from a more general reporting contribution to very detailed specifications provided by data mining tools.

As I am quite satisfied about the significant strategic relevance of BI in general, I will check in the next chapter whether BI tools in reality effectively do provide these functionalities as well.

Chapter 4 BI Solutions in Practice

In this chapter I will focus on the functionality of BI tools in practice. First of all I would like to check to what level they cover the theoretical components discussed in theory in chapter 2. Do they really support reporting tools, OLAP as well as data mining? Notice that this chapter is just an illustration of the theoretical part of chapter 2, while the alignment between BI and strategic management is discussed in chapter 3. Therefore, in this small chapter I will focus on the alignment between the practical BI functionalities and the theoretical ones discussed in chapter 2. In sections 4.1 and 4.2 Microsoft SQL Server 2005 and SAS Enterprise BI Server will be discussed respectively. Since these applications' trial versions require too much disk space I could not manually carry out their functionalities. As you can see in the footnotes, I based myself on documents which I tried to put in perspective of this dissertation.

4.1 Microsoft SQL Server 2005[9]

Microsoft SQL Server 2005 is an integrated data management and analysis platform for enterprise data and BI applications. Below, the main tools of this platform are described.

- The **relational database** is a secure, reliable database engine with performance for both structured and unstructured data.
- **Replication services** refer to the possibility to replicate data for all kinds of applications such as distributed or mobile data processing applications. This enables also an optimal integration with heterogeneous systems, even Oracle databases.
- **Notification services** are services capable for the development of applications that can deliver timely customized information updates to all kinds of devices.
- **Integration services** refer to extraction, transformation and loading (ETL) capabilities for data warehousing and data integration.

[9] http://www.microsoft.com/sql/2005

- **Analysis services** refer to OLAP capabilities for sophisticated analysis of large or complex databases.
- **Reporting services** enable creation, management and delivery of both traditional paper reports and interactive Web-based reports.
- **Management tools** are useful to manage databases and integrate them with other existing tools such as Microsoft Operations Manager (MOM) and Microsoft Systems Management Server (SMS). Moreover, this platform ensures interoperability with other platforms and applications.
- **Development tools** support ETL, data mining, OLAP and reporting. They are all integrated with Microsoft Visual Studio which provides software development capabilities.

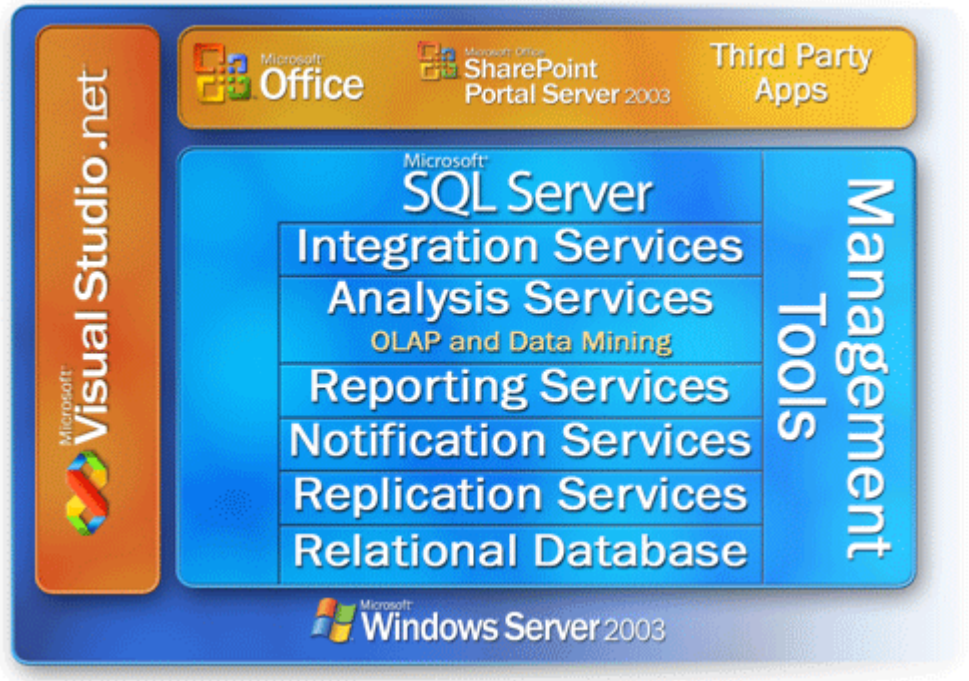

Figure 22 Layout Microsoft SQL Server (Source: http://www.microsoft.com/sql/2005/)

Figure 22 shows the layout of the SQL Server 2005 data platform. Reporting services deliver reports to all management layers containing all information they need, including these of virtual business scenarios. Analysis services provide integrated views of business data which may be needed for traditional reporting, OLAP, scorecards, or data mining. The data mining capabilities in the development tools enable users to explore

data, discover patterns, and unveil hidden trends about products, markets, and customers. The data miner wizard enables many users to create their own sophisticated models with only a few mouse clicks. Because of its integration with Microsoft Visual studio, an application development tool, the data mining toolset lets users explore, manipulate, and visualize data and results. Integration services enable integration of data from large varieties of data sources in order to retain holistic views of all business activities. In other words, it is clear this platform provides all necessary BI features. Reporting tools, OLAP tools as well as data mining tools are not just provided as individual functionalities; in fact all features are well integrated thanks to integration services.

4.2 SAS Enterprise BI Server[10]

Like Microsoft SQL Server, SAS Enterprise BI server is also an integrated platform providing BI capabilities. The platform applies both SAS Analytics and data integration to create a BI solution. Below you can find an overview of its components.

- **Reporting**: SAS provides a self-service reporting capability through familiar interfaces adapted to all technical levels. Wizards guide users to create their customized reports from a large variety of data sources without any IT involvement in order to stress the business user view of data. This BI tool provides a large variety of reporting interfaces and capabilities through different other products such as SAS Web Report Studio, SAS Add-In for Microsoft Office and SAS Integration Technologies. As a result, analytic results from SAS Analytics or Microsoft Office can be integrated in reports. Figure 23 illustrates an example of SAS Web Report Studio. As you can see, business users can choose the information they need.
- **Query and Analysis**: Self-service query capabilities are available for all levels of users based on needs and skills. Queries can be carried out across multiple data sources. The use of wizards hides this complexity of data structures and

[10] http://www.sas.com/technologies/bi/entbiserver/index.html

supports the integration of query capabilities within the business user reporting environment.

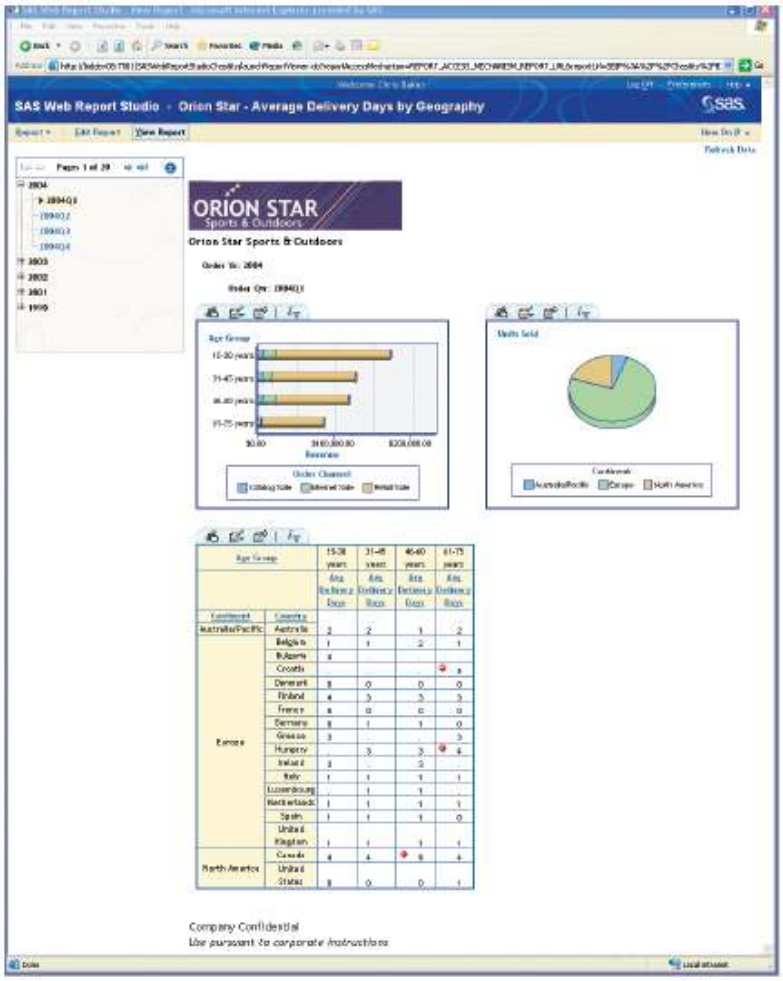

Figure 23 SAS Web Report Studio (Source: http://www.sas.com/technologies/bi/query_reporting/addin/factsheet.pdf)

- **OLAP**: SAS provides easy to use interfaces to create and maintain OLAP cubes, which may be created based on data stored anywhere. OLAP cubes can be stored on any platform, and the OLAP data storage and navigation are integrated into the reporting environment. Users can customize their front-end to retrieve only data relevant for their job. Interactive OLAP applications and the Web-based data exploration interface allow business users to get high-level views of data, as well as increasing levels of detail.
- **Integrated analytics**: SAS Analytics provides descriptive and predictive statistics such as forecasting, optimization analyses, time series analyses, scoring

algorithms, and custom analytic models. These analytics were previously only available only to technical users. Decision makers now have access to more sophisticated analyses directly from the BI interface without the need of IT or statisticians. Moreover, analytic technologies can be accessed via reporting and query and analysis capabilities.

- **Visualization**: Software like SAS Web OLAP Viewer for Java and SAS/Graph provide the possibility to summarize and present data using a variety of customizable charts and plots, which can be sent to approximately any device. Within the OLAP application for example integrated geographic maps are interfaces enabling interactive data exploration. Also interactive graphics can be embedded into Web pages and Microsoft Office documents. An example of a Web-based OLAP interface was already shown in Figure 13.
- **Microsoft Office Integration**: SAS Add-In for Microsoft Office enables business users to access, report and analyze data directly from Microsoft Office environments without requiring users to have advanced statistical skills. This add-in even expands the analytical options available to Microsoft Office users. Results can be embedded in Microsoft Word documents. Figure 24 shows an example of a SAS forecast analysis integrated in a Microsoft Excel environment.

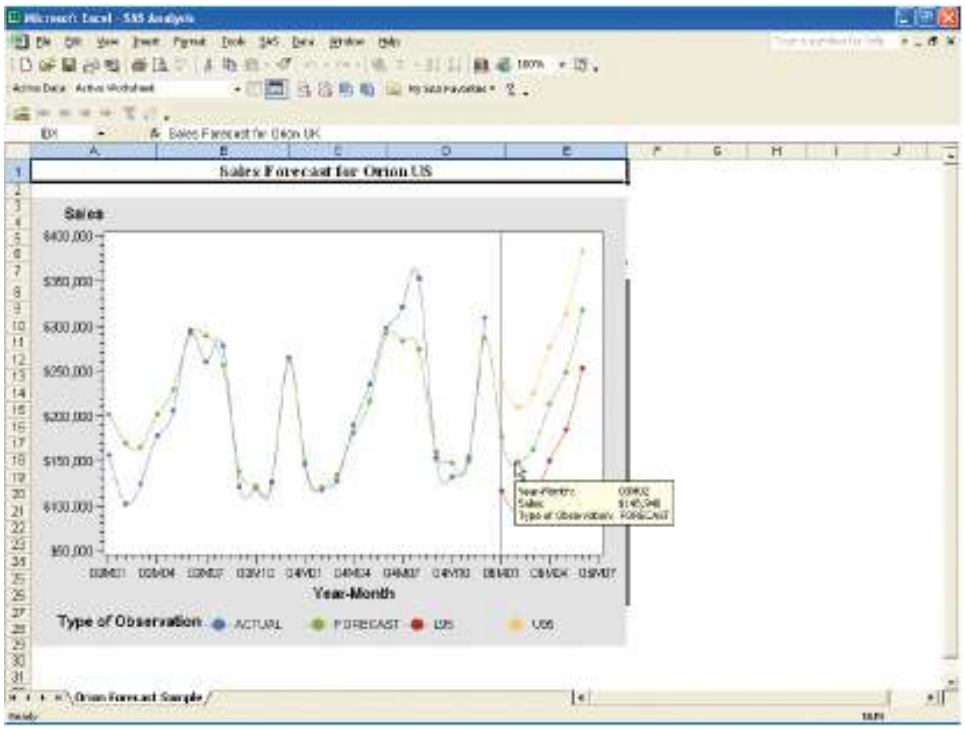

Figure 24 SAS analysis integrated in Microsoft Excel environment (Source: http://www.sas.com/technologies/bi/query_reporting/addin/factsheet.pdf)

It is very clear SAS Enterprise BI Server abundantly provides the 3 BI tools discussed in chapter 2. Figure 23 illustrates reports can be designed and customized adapted to each user skill. Reports can be based on multiple data sources in order to provide all kinds of users the information they need, aggregated or detailed. As briefly explained above, OLAP is also very present in this BI tool. Especially the new feature of the Web OLAP viewer enables users to explore data in multiple views.

The strongest feature of this BI tool in my opinion is the integration of SAS Analytics into this platform. As analytics has always been SAS' showpiece in the past, its integration is very valuable in this platform. Moreover, SAS claims both data mining experts and non-technical users are able to perform the same analytics thanks to user friendly interfaces adapted to each technical level. I think we should put this statement into perspective because in my opinion an analyst should have per definition at least basic notions about statistics or data mining techniques to do complex analyses. Only when this condition has been fulfilled using wizards makes sense to me and can facilitate the design of complex models. Moreover, as discussed in chapter 3, data mining should always remain tactically flavoured. I don't think there is a strategic executives' need to be familiar with the design of detailed and complex models, they should always preserve their helicopter view on the company. Nevertheless thanks to this integration of SAS Analytics data mining features are definitely covered. Like Microsoft SQL Server, SAS also claims to provide a maximum of integration of solutions. As described above, I think both systems pay sufficient attention to centralized management of data, metadata and security which affects the total cost of ownership in a positive way.

4.3 Conclusion

In this chapter I briefly described the main functionalities of both Microsoft SQL Server and SAS Enterprise BI Server. Both server systems definitely satisfy my expectations, as they both abundantly offer reporting, OLAP, and data mining tools which are well integrated into all other features. In my opinion, Microsoft SQL Server has still this advantage of their popularity of their other Microsoft tools such as Microsoft Office, which are easily integrated in this BI server system without any transformation

requirements. Nevertheless, also SAS provides integration services enabling users to perfectly interact with Microsoft documents as analysis input or output. SAS on the other hand has the advantage of their SAS Analytics' popularity which is still the common standard of data analysts. As you can see, both systems definitely provide all BI tools, but choosing one out of them might depend on your preference on integration or familiarity with one of both systems.

Chapter 5 Case: MTV Europe [11]

In this chapter I will discuss a real life case concerning the strategic relevance of implementing BI. This case deals with implementing BI in MTV Europe's strategy planning. They are confident this definitely improved their corporate strategy. In the first section the problem situation of the company is described, whereas in the second section the solution of their problem is discussed. In the third section the main benefits for MTV Europe will be discussed and finally a small conclusion will end this small chapter in 5.4.

Since this company is founded in the UK and because of a lack of time I couldn't carry out face-to-face interviews with local executives or managers. Therefore, I based this case study on a document on the Microsoft website as you can see in the footnote. I translated this information in perspective of this dissertation.

5.1 Situation

MTV Europe is one of Europe's biggest music TV networks. As part of the Viacom Group, the most successful US entertainment conglomerates, MTV Europe's television channel reaches approximately 400 million European families in 170 different geographical areas. Their motto 'think globally, act locally' is reflected in the corporate strategy, as promotion of local cultural and musical events and artists are widely spread throughout the network. In this sector the speed to react to the market is extremely important, therefore quick and accurate data delivery in a stable supporting system is definitely one on the key performance indicators. Notice that in chapter 3 the balanced scorecard was introduced as a measuring tool to monitor key performance indicators. I also explained how BI could contribute in this perspective.

By the end of the '90ies MTV Europe had to face strong competition of many local players in the music television market. Without any reaction MTV Europe was about to loose market share. To maintain competitive MTV needed to react. Managers needed

[11] http://www.microsoft.com/uk/windowsserversystem/bi/casestudies.mspx

more detailed ratings analyses for example for the many campaigns they broadcast across multiple channels at the same time. As already mentioned, responding very quickly to the market is a must in this sector, a new system to forecast and analyse advertisement and sales revenues was needed. Through this way the company wanted to optimize revenues and strategic planning.

In 2002 they decided to implement Microsoft SQL Server in their strategic planning and advertisement sales operations. Up to that moment MTV Europe only used Microsoft Office tools for reporting and analysis. As you may have expected, this legacy system was not able to tackle the increasing complexity and volumes of data. In order to optimize advertisement revenues a more stable and robust system was needed. MTV needed to know exactly how much advertisement space had been sold, which of their clients had bought the space, and where was still space available to sell. Also a reporting mechanism in local currencies was needed to maintain efficient local reporting. Following quote of Daron Roberts, Director of strategic planning of MTV Europe, illustrates the need of accurate operational data reporting systems in order to improve strategic decision making:

"The ability to manage, monitor and react to business intelligence is fundamental to the success of our business. The MTV Europe sales team are now covering a lot more channels and data is growing in volume and complexity. By optimizing such systems, our enhanced reporting and analytical capabilities can ensure that senior executives and planners all receive the latest business intelligence."

5.2 Solution

Business and Decision, a Microsoft partner and specialist in business information and data warehousing technologies, designed and implemented a data mart program with OLAP cubes in Microsoft SQL Server 2000. Microsoft Analysis 2000 enabled a totally integrated solution by integrating OLAP cubes within SQL Server. An additional financial data system was added as well as an additional reporting service, Microsoft SQL Server Reporting Services. This implementation enabled integration of the data management capabilities of SQL Server with applications of their Microsoft Office

System which they were familiar to. Because of this integration real time information supported daily operations and decisions. Especially for MTV Europe Business and Decision designed a new information management process, providing data warehousing, on-line analytical processing, as well as Web delivery through the MTV intranet.

5.3 Benefits

Thanks to the new system more and complex data could be processed on a robust and stable system environment. Detailed revenues, forecasting and analysis reports are now automatically spread via e-mail through the intranet and provide support to increase sales income. As a consequence, the return on investment can be monitored proactively. The additional financial component provides detailed analysis and consolidations of different geographical regions, often in separate currencies, to sales executives and planners.

MTV Europe is also confident this solution will deliver huge productivity gains as well as efficiency savings. These huge savings reflect a low total cost of ownership with Microsoft technology.

Besides tackling data complexity and instability, Microsoft SQL Server also delivered very low support and development costs in a single solution. A specialized development tool enables MTV to reuse code in different broadcasting channels. As a result the level of consistency across different client regions has increased significantly.

5.4 Conclusion

In this chapter the MTV Europe case was discussed. Because of the increasing amount of data and complexity, MTV Europe needed a new and robust data reporting and analysis system. Moreover, MTV Europe had to tackle lots of local competitors, which were able to react to the market much faster. Therefore, this big system should enable the company to gather more accurate information, much faster.

MTV Europe implemented Microsoft SQL Server and had reporting and OLAP functionalities installed and integrated with existing systems. This enabled more accurate forecasts and analyses concerning local markets. Moreover, senior executives are able to dig into large amounts of data supported by OLAP functionalities. Results increased tremendously for MTV Europe. In this case BI tools especially reporting and OLAP functionalities contributed a lot to MTV Europe's strategic plan and could be considered as one of the drivers of their sustained competitive advantage.

Chapter 6 General conclusions

The main purpose of this dissertation was to investigate the contribution of BI to strategic management. After defining some aspects of the information needs on strategic level, and defining the functional capabilities of BI tools, I aligned both. To be honest, while writing the first chapter I realized that BI covering all these strategic needs would be very difficult. Nevertheless, while writing the second chapter I was almost astonished about the BI capabilities and business relevance. Especially data mining tools can really unveil unexpected or hidden relationships in data which could provide valuable information to companies.

A first surprising conclusion for me was BI is not only contributing to the strategic level of an organization, but also to the tactical and even operational level. I concluded in chapter 3 that reporting and OLAP tools are very contributing to strategic management as they measure the big picture of the organizations performance. The balanced scorecard was introduced at this level, which indicates whether BI reporting and OLAP results match the critical performance indicators or not. Data mining tools analyse data in such a way to retrieve the maximum of information out of them. As a consequence, they provide extremely valuable intelligence such as defining new business opportunities. As these tools mostly deal with specific and focussed issues, I situated them at tactical level of an organization. Nevertheless, since tactical information is consolidated in bottom up direction, they do indirectly support strategic level as well. Reporting tools distribute relevant results to the right persons, on the right time, and in the right format. Since time aspect has become an important factor to achieve competitive advantage, this functionality is indispensable at all organizational levels. They are also contributing to operational management, as they support automating standardized procedures.

Concerning the key intelligence topics the main conclusion can be subdivided. On the one hand, producing or providing intelligence for the first category of strategic decisions and issues was relatively easy because internally related data are processed. Data about the company and its main competition and customers is relatively easy to retrieve and to process. On the other hand, providing more externally flavoured data

about unexpected future situations, indirectly related market players or non-quantitative situations are not always easy to process and require much more human intervention. Concerning external information, I would like to mention the importance of external data vendors who can sometimes bypass these inconveniences. Nevertheless I have shown BI could definitely support these human activities by for example providing estimations and support in the design in scenario analyses, which –when properly carried out- can result in competitive advantage as well.

The same conclusion counts more or less for the 3 strategic analysis techniques. Using BI tools to defining internally related information to make a SWOT analysis is much easier than defining externally related information, which requires more human intervention. For this reason I consider (internal) strengths and weaknesses easier to define than (external) opportunities and threats. Moreover, defining competition's strengths and weaknesses requires definitely additional data sources to retrieve business intelligence out of them. In contrast, involving BI tools to design a BCG matrix in my opinion adds even more features to this analysis technique. Since BI tools enable continuously monitoring a dynamic and continuously updates BCG matrix could be retrieved. I am confident this dynamic feature could contribute to other strategic techniques as well. The combination of reporting, OLAP and data mining techniques definitely contribute a lot to carry out scenario analyses. But, depending on the scenarios and quality of information, different levels of accuracy of this technique are reached. The less available information, the more human intervention is required for interpreting BI results.

The last conclusion deals with the MTV Europe case. As you might have noticed only the least complex BI tools, namely reporting and OLAP, could already transform and improve business results tremendously. I can conclude that companies nowadays still struggle with the increasing amounts of data. I can imagine today this data boom still causes lots of chaos situations in many companies. But, when properly managed, we have seen that BI can definitely turn this 'inconvenience' or 'disadvantage' into a huge competitive advantage. Retrieving information on the right time nowadays counts definitely to one of a company's key activities. In other words, implementing BI provides the indispensable capabilities for this important issue. This relatively simplistic capability is in my opinion a basic condition to be fulfilled before implementing data

mining. Because of complex levels of data sources and analyses one should be very experienced in managing data. Therefore, to fully benefit from these increasing amounts of data, a company is morally obliged to implement BI.

List of Figures

List of tables

References

Aronson J. E., Liang T-P, Turban E. (2005). *Decision Support Systems and Intelligent Systems*. Pearson Education International.

Barko C.D. & Nemati H.R. (2001). Issues in Organizational Data Mining: a survey of current practices. *Journal of Data Warehousing*, Vol.6, No.1.

Bensoussan B. E., Fleisher, C. S. (2003). *Strategic and Competitive Analysis*, Pearson Education International.

Bradford R.W., Duncan J.P. & Tarcy B. (1999), *Simplified Strategic Planning: A No-Nonsense Guide for Busy People Who Want Results Fast!* (Paperback), Chandler House Press.

Dess, G. G., Lumpkin G. T. & Taylor, M.L. (2005), *Strategic Management*. 2 ed. New York: McGraw-Hill Irwin.

Drucker P. (1959), *Landmarks of Tomorrow: a report on the new post-modern world*, New York: Harper & Brothers.

Hamers, Z. & Buytendijk F. (1999) Informatie*, maandblad voor informatievoorziening.*

Haskett M. (2000). An intro to Data Mining, Part 2: Analysing the Tools and Techniques. *Enterprise systems Journal*.

Hatcher, D. (2003), *Sharing the Info Wealth*. ComputerWorld.

Hax A. & Majluf N. S. (1983). The use of the Growth Share Matrix in Strategic Planning. *Interfaces*, 13(1).

Herring J. P. (1992), The role of intelligence in formulating strategy. *Journal of Business Strategy*, Vol. 13.

Herring J. P. (1999), Key Intelligence Topics, a process to identify and define intelligence needs, *Competitive Intelligence Review*, Vol. 10(2).

Hill, T., Westbrook R. (1997). SWOT analysis: It's time for a product recall, *Long Range Planning*, 30(1).

Kahaner, L. (1997), *Competitive Intelligence*, Touchstone/Simon & Schuster.

Kennedy P. & Perrottet C. (2003), Scenario Planning after 9/11: Planning for Disruptive Events" (forthcoming in *Strategy and Leadership*).

Kroenke D.M. (2006). Database Processing. Fundamentals, design and implementation. *Pearson Education*.

Mintzberg H (1992), *Five Ps for Strategy*. In: Mintzberg H. & Quinn J.B. eds. *The Strategy Process*, Prentice-Hall International Editions, Englewood Cliffs N.J., pp. 12-19.

Mintzberg H. (1994), *The Rise and Fall of Strategic Planning*, Basic Books.

Porter, M. (1980). Industry structure and competitive strategy: keys to profitability. *Financial analysts journal*, 36 (4).

Porter M. (1986), Competitive Strategy, *Harvard Business School Press*.

Porter M. (1996), What is Strategy?, *Harvard Business Review*.

Sawka K. A. (1996). Demystifying competitive intelligence, *Management review*, Vol. 85, No. 10.

Schoemaker P.J.H. (1995). Scenario Planning: a tool for strategic thinking. *Sloan management review*, 36(2).

SPSS Clementine 9.0 Users Guide (2004).

Vriens, D. & Philips E.A. (1999), *Business Intelligence*, Marketing Wijzer, Kluwer.

Webpages

http://www.lrc.edu/planning/

http://www.globalintelligence.com/

http://www.pcc.qub.ac.uk

http://www.cibit.nl

http://www.sas.com/technologies/bi/entbiserver/

http://www.sas.com/technologies/bi/query_reporting/addin/factsheet.pdf

http://www.microsoft.com/sql/2005/

http://www.microsoft.com/uk/windowsserversystem/bi/casestudies.mspx

http://www.dmreview.com/article_sub.cfm?articleId=1002442

http://www.fairisaac.com/fairisaac

http://www.balancedscorecard.org/basics/bsc1.html

http://www.proclarity.com/