

# Towards chain wide Business Intelligence

Business Intelligence in the Dutch Retail Sector

Master Thesis

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Master of Business Information Technology

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## Management Summary

In sectors like the Retail, where margins are small and the turnover rate is high, information is necessary in order to have competitive advantage. Business Intelligence can deliver such information in time. This research focuses on the use of Business Intelligence in the Dutch Retail sector. The main research question is:

*How is Business Intelligence used in the Dutch retail sector and how will it be used in the future?*

From theory on steering of processes it comes true that information is necessary in order to steer effectively. Therefore Business Intelligence can play a role in this steering. A good model to determine the Business Intelligence maturity of an organisation is the Business Intelligence Maturity Matrix, which distinguishes four levels of maturity (local, coordinated, integral and intelligent) at the dimensions BI-ambition, BI-organisation and BI-architecture.

The retail sector is very extensive. A distinction can be made between food and fashion retail. The processes of retail organisations can be divided in primary and secondary processes, but the most important process in retail organisations is the integration of these processes. Therefore integral information is needed, which can be delivered by Enterprise wide Business Intelligence.

Trends in the retail sector are: ongoing innovation, supply chain integration and increasing complexity. These influence the use of Business Intelligence. Because of the trend supply chain integration, retail organisations need chain wide Business Intelligence in order to get information about the whole chain. When this is realised the whole chain from suppliers to customers can be optimised. This will lead to cost reductions and increased sales.

In order to see if Business Intelligence is used this way in the Dutch Retail sector, empirical research towards the usage and maturity of Business Intelligence is done in ten Dutch retail organisations. These organisations are both from the food and fashion retail sectors. The results of this research are as follows. The average Business Intelligence maturity level of these ten organisations is coordinated. There is a correlation between the three factors of the Business Intelligence Maturity Matrix and also between the maturity and usage level of Business Intelligence. There is no significant difference between food and fashion retailers in the usage and maturity of Business Intelligence. The use of Business Intelligence is higher in primary processes than the secondary processes. Only two organisations use Business Intelligence in the integration of processes. Business Intelligence is mostly used for reporting and OLAP.

The maturity and usage of Business Intelligence at the Dutch Retail sector is not sufficient to fulfil the trends in the retail sector. In order to be ready for chain wide Business Intelligence, it is necessary to have an integral Business Intelligence system. Therefore the Dutch Retail organisations have to evolve their Business Intelligence to an integral system. Also the usage of the system has to be stimulated. And in the last place the relation with the other parties has to be strengthened. When they can realise this, the organisation is ready for chain wide Business Intelligence. Cost reductions, competitive advantage and increasing sales will be the result.

## Preface

This Master Thesis is the result of my study Business Information Technology at the University of Twente. With this thesis I do not only finish my study, but also a period in my life. A nice period, with a lot of freedom and a lot of learning moments, both in my study and in general. But it is time to make a new move. The real life can begin!

Writing a Master Thesis is as climbing the l'Alpe d'Huez with your bike. It takes quite some time and energy. And most people, as I, do have some periods in which the speed is not that high. Then it makes it easier if there are people at the side of the road which encourage you and give you something to eat in order to get new energy. It is certainly not always easy and sometimes you want to turn around. But after the climbing, when you are on the top, you feel powerful. You have made it! That is exactly the same feeling I have at this moment after writing this Thesis.

I want to thank all people who encouraged me from the side of the road.

In the first place, Roland Mueller and Maurice van Keulen as my respectively first and second supervisor from the University of Twente and Edwin van Megesen from E-mergo, my external supervisor. They all take a lot of time to read my draft versions and give useful comments on it.

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And last, but certainly not least, I want to thank my wife, Marieke, for supporting me during my whole study. As my biggest fan, she encouraged me the most during the writing of the Thesis especially in periods when my motivation was shrinking.

I hope you enjoy reading this Master Thesis.

Corneel Hindriks

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**“It’s all knowing what to start with. If you start in the right place and follow all the steps, you will get to the right end.”**

*Elizabeth Moon(1945-present)*

## **1. Introduction**

In today's business life an organisation cannot survive without good management information. Especially in sectors where the margins are small and the turnover rate is high, for example the retail sector, knowledge is power. An example is the price war which Albert Heijn started three years ago. The marketing and sales departments of all organisations wanted to know the effect of the lower prices on sales, they also wanted to forecast and set out trends. This demand of information requires an adequate information supply.

Business Intelligence (BI) systems and data warehouses can deliver such information in time by combining and presenting the information in a smart way.

The BI systems need to handle a lot of information from different systems, both internal and external to the organisation. Different systems store data in different ways and use different definitions of the data. This makes the implementation of BI systems complex.

E-mergo, an organisation that is specialised in BI, wants to research how the front runners in retail handle such issues. It is interesting to know what their business cases and their main business drivers were at the start of their BI-projects. And of course how BI is actually used and to what extent the system fulfils their expectations.

### **1.1. Objectives**

The main objective of this research is to study the use of Business Intelligence in the Retail-sector. The main research question is:

*How is Business Intelligence used in the Dutch retail sector and how should it be used in the future?*

To answer this question the following sub research questions will be answered:

1. What is the state of art in Business Intelligence?
2. How can retail organisations be classified?
3. What does the primary process in retail organisations look like?
4. What part of the retail process adds the most to the overall performance?
5. What are the trends in the retail sector?
6. What does the business case of Business Intelligence systems in retail look like?
7. Which Business Intelligence features are used in retail?
8. What is the Business Intelligence maturity of retail organisations?
9. To what extent is Business Intelligence used in retail?
10. What are the differences of the maturity and use of Business Intelligence between food retail and fashion retail?
11. To what extent do the maturity and use of Business Intelligence in retail organisations differ from theory?
12. To what extent will trends in the retail sector influence the Business Intelligence maturity and use?

## 1.2. Hypothesis

The expected result of the research is that Business Intelligence is already used a lot in the Dutch retail sector, although it has to be used more in order to meet the information demand which trends in retail need. Therefore Retail organisations have to proceed investing in Business Intelligence. These investments have to be in two areas: the start up of new projects and the ongoing management of the Business Intelligence system.

## 1.3. Scope

It is important to scope the research, otherwise it will never finish. Therefore only the use of Business Intelligence is researched at ten Dutch retail organisations. In all these organisations four people will be interviewed.

## 1.4. Approach

The approach for this research can roughly be divided in two parts: theoretical and empirical. A graphical overview of this Thesis can be found in Figure 1. In the first part research is done towards BI and the retail sector. The empirical part is done towards specific BI-implementations in the retail sector. In this part interviews are held with people with different roles (BI-manager, BI-employee and end users) in ten retail organisations.

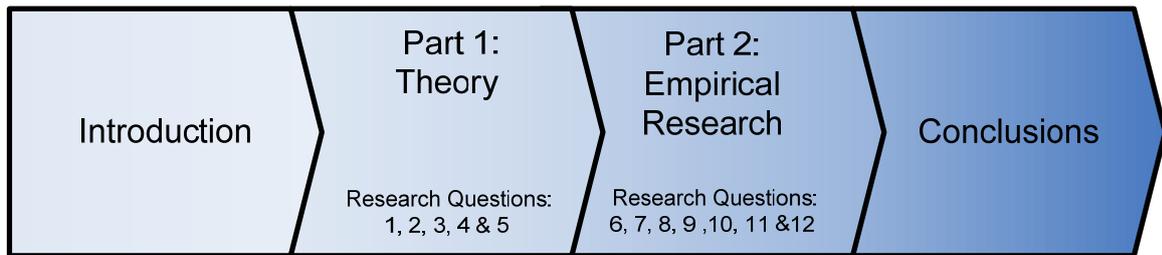


Figure 1: Overview of this Thesis

### 1.5. Layout of Thesis

As said in the previous paragraph, this thesis is divided into two parts. The first part discusses the theory on the different subjects, the second part shows the empirical research.

The first part starts in Chapter 2 with analysing the need for Business Intelligence. This chapter describes theory on steering of organisations. After that Chapter 3 discusses theory on Business Intelligence. Chapter 4 gives an overview of the retail sector. Chapter 5 continues with describing trends in the retail sector.

The second part gives the design of the empirical research in Chapter 6. The results of the research are described in Chapter 7. The second part finishes by combining the results of the research in Chapter 8.

Chapter 9 gives the conclusions of the research. Also recommendations and suggestions for further research are presented.

## **Part 1: Theory**

**“Drive thy business or it will drive thee.”**

*Benjamin Franklin, 1706-1790*

*American writer and politician*

## **2. Steering of organisations**

To understand the need for Business Intelligence it is necessary to look at the theory of steering organisations. The goal of Business Intelligence is of course that something is done with the new insight that it delivers. The outcomes have to support the actual steering of processes. De Leeuw (1982) defines steering as: *“every kind of directed influence”*. In the next paragraphs theory on steering and performance management is further elaborated.

### **2.1. Steering Institute vs. Steered system**

De Leeuw (1982) has described a simple model which is still very useful for understanding the steering of organisations. He states that every steering situation has a steering institute (SI) and a steered system (SS). The steering institute gets information from the environment and the steered system and makes decisions to steer the system or influence the environment. The environment and the steered system influence each other continuously. In Figure 2 on the next page this model is shown. The arrows in this figure represent the dependencies between the entities. These dependencies consist of giving information to the other entity and influencing the other entity.

There are many different SI-SS situations in an organisation which are linked to each other. These situations can occur across organisational structures. But in general there are three different layers of steering in organisations: Strategic, Tactical and Operational. The number of people that take the decisions is different at each level. The operational level counts the most decision makers, the strategic level the least. This can be visualised in a pyramid with the operational level on the bottom, strategic level on top and tactical level in between.

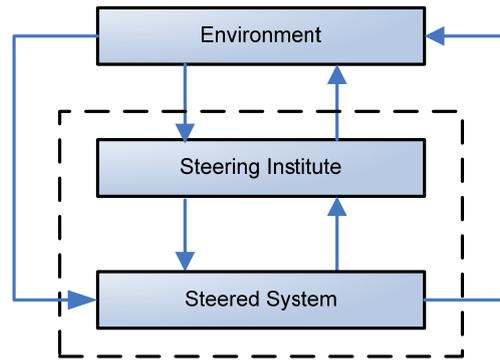


Figure 2: Steering institute vs. Steered system

It is essential for a steering institute to get the right information. Right means that they get all the information they need, that they get it on time and that the information is accurate.

## 2.2. Steering of processes

In the book of Van der Bij, Broekhuis and Gieskes (2001) a model is presented for the steering of processes. A process changes a certain input in a desired output. To ensure that the actual output is similar to the desired output some steering decisions have to be made. To steer the process it is essential to firstly gather data about the output of the process. It is even better to gather data about the process itself, so the steering decisions can be made earlier. The data has to be compared with the defined norm. When differences occur the steering institute has to make steering decisions to change the input of the process or the process itself. In Figure 3 this is graphically shown.

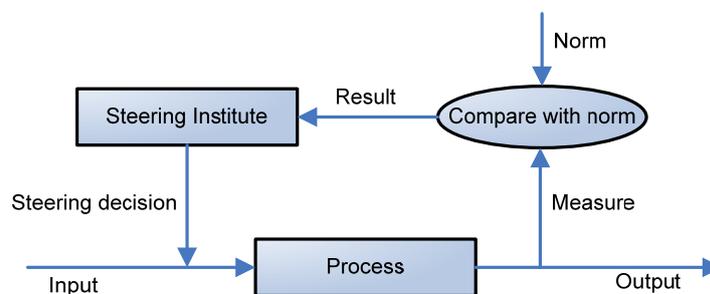


Figure 3: Steering of processes

## 2.3. Effective steering

To ensure that the steering is effective De Leeuw (1982) describes five conditions for effective steering that are used in System Theory. It is essential that all of them are satisfied, otherwise the steering will result in a failure. The other way around is not necessarily true; if all conditions are satisfied, it is not guaranteed that the steering is successful. In the following these conditions are discussed.

- *An objective*  
An objective is needed to evaluate the effects of the steering decision.

- *A model of the Steered System*  
A model of the Steered System is needed to steer the system in a directed way. Through this model the expected effects of different steering decisions can be determined. In this way a founded choice can be made for the most valuable steering decision.
- *Information about environment and state of the system*  
Information about the environment and the state of the system is needed because besides the steering decisions those also determine the future state of the system.
- *Sufficient steering decisions*  
Of course it is important to have a sufficient collection of steering decisions for every possible state of the system. Otherwise it is not possible to steer the system in every state.
- *Sufficient capacity for information processing*  
To select the right steering decision it is essential to get the right information and combine it with the objective and the model of the system. On the base of that combination an effective steering decisions can be made. To fulfil this process sufficient capacity for information processing is needed.

De Leeuw (1982) states that information is needed for all of the above conditions and not only for the last one. Thus 25 years ago, he pointed out that information is needed for effective steering. This is not changed yet, information is still needed. The amount of data that can be transformed into information is nowadays much larger. Also the capacity for information processing is still growing. This means that decisions can be made over a much broader perspective than 25 years ago.

#### 2.4. Points of contact between processes

In the first paragraph the tangle of SI-SS pairs was mentioned. At department level every department has one overall SI-SS pair which regulates the others. At organisation level also one overall SI-SS pair exists. It is essential that those SI's at each level take care that every SI-SS pair of the lower level is managed in a way that it meets the overall objectives. In this way sub-optimisation of processes will not occur. Besides that the Steering Institute at organisational level has to ensure that everything runs smoothly at the points of contact between processes.

#### 2.5. Performance Management

In the last years, performance management is a hot topic for organisations. To stay in business they have to do their work excellently. Michael Nash has written about this subject already in 1983 (Nash, 1983).

Traditional performance management focussed mainly on financial measures. It is easy to compare financial numbers, but also non-financial measures are important. The non-financial measures contribute over time to the financial numbers. (Nash, 1983) If for example the customer satisfaction in a period raises, it does not necessarily mean that profits will increase. This might only happen over time.

## 2.6. Balanced Scorecard

To measure performance, Kaplan and Norton (1996) have developed the Balanced Scorecard which is nowadays a wide-spread used methodology. The Balanced Scorecard consists of both financial and non-financial measures and is in this way an integral instrument for performance management. The Balanced Scorecard can be used at all levels in the organisation. The management at each level has to contribute to the overall management. Therefore it is good to use the same measures through the whole organisation.

The Balanced Scorecard consists of four perspectives: financial, customers, internal processes as well as learning and growth. For all of these perspectives Key Performance Indicators (KPI's) are set up. Every KPI has an objective, measures, a norm and initiatives. In Figure 4 an example of the Balanced Scorecard is shown.

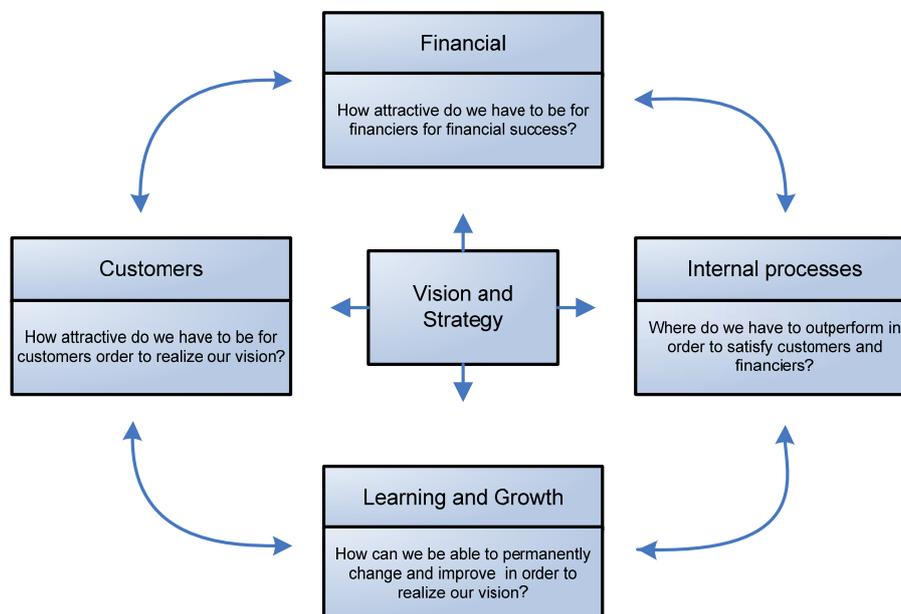


Figure 4: The Balanced Scorecard

## 2.7. Conclusion

De Leeuw (1982) pinpoints that information about the steered system and the environment is necessary for effective steering. In performance management, for example the Balanced Scorecard, information is also important. Organisations need a good information supply in order to steer their processes effectively. Business Intelligence makes it possible to deliver this information on time. In the next chapter Business Intelligence is discussed.

**“The essence of intelligence is skill in extracting  
meaning from everyday experience.”**

*N.V.*

### **3. Business Intelligence**

In the previous chapter theory on steering of organisations is elaborated. The major conclusion from that chapter is that in order to make good steering decisions, information about the process and the environment is necessary. This chapter explains how Business Intelligence delivers such information.

#### **3.1. History**

The roots of Business Intelligence are in the field of Information Management. The area of Business Intelligence exists for almost forty years, although the term Business Intelligence was not yet mentioned (Negash & Gray, 2003). Predecessors of Business Intelligence are Decision Support Systems, Executive Information Systems and Management Information Systems (Thomsen, 2003). The term Business Intelligence was first used by Howard Dresner of the Gartner Group in 1989.

#### **3.2. Definition**

Before the theory on Business Intelligence can be discussed it is necessary to define it. There are several different definitions of BI. Most of them have a very technologic perspective. In this research the definition of Den Hamer (2005) is used:

*Business Intelligence is the directed process with the corresponding facilities to collect and analyse data and to use the product of both: information.*

In fact Business Intelligence gathers all raw data from operational systems and transforms it into useful information for end users. It is important to see the difference between data, which is not useful for end users, and information in which data can be transformed in order to be useful for end users. Data is for example all point of sale data of a grocery: a long list with rows. An end user wants to know the top ten of products

sold most during a specific day. It is impossible for him to scroll down all rows and count the times a product occurs and then pick out the top ten. If the BI system delivers such a list; data is transformed into information.

### 3.3. Business Intelligence Maturity Matrix

In order to measure the maturity of an organisation with regard to Business Intelligence, several subjects are important: BI-ambitions, BI-organisation and BI-architecture. CIBIT (a Dutch education institute) has developed a matrix in which this is visualized. Each dimension operates on one of the following levels: local, coordinated, integral or intelligent. In Figure 5 this matrix is shown.

	Local	Coordinated	Integral	Intelligent
BI Ambitions	<ul style="list-style-type: none"> <li>- 'Understand'</li> <li>- Department level</li> <li>- Explanation afterwards</li> </ul>	<ul style="list-style-type: none"> <li>- 'Improve'</li> <li>- Limited consolidation</li> <li>- Timely steering</li> </ul>	<ul style="list-style-type: none"> <li>- 'Optimize'</li> <li>- Integral view of organization</li> <li>- pro-active use of information</li> </ul>	<ul style="list-style-type: none"> <li>- 'Innovate'</li> <li>- Also BI for partners and customers</li> <li>- Intelligent organization</li> </ul>
BI Organization	<ul style="list-style-type: none"> <li>- Various project teams with mainly IT-people</li> <li>- Local principals</li> <li>- Ad hoc development and management</li> </ul>	<ul style="list-style-type: none"> <li>- Shared project bureau</li> <li>- Program management</li> <li>- Steering by IT management</li> <li>- Growing professionalism</li> </ul>	<ul style="list-style-type: none"> <li>- BI Competence Centre</li> <li>- Reuse and repeatable quality</li> <li>- BI governance</li> <li>- Steering by CIO</li> </ul>	<ul style="list-style-type: none"> <li>- Shared Service Centre</li> <li>- BI full part of the business management and operations</li> <li>- BI = board issue</li> </ul>
BI Architecture	<ul style="list-style-type: none"> <li>- Separate datamarts</li> <li>- Many different tools</li> <li>- No standards</li> <li>- Minimal dataquality assurance</li> <li>- Reports / few analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Consolidation of data warehouses and datamars</li> <li>- Tool standarization</li> <li>- BI Portals</li> <li>- Metadata exchange</li> <li>- Interactive analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Shared datamarts</li> <li>- Standardization of datamars</li> <li>- Data cleansing</li> <li>- Shared metadata</li> <li>- Complex analysis</li> <li>- Shared framework</li> </ul>	<ul style="list-style-type: none"> <li>- Organization wide information integration</li> <li>- Continuous improvement of processes</li> <li>- BI services</li> <li>- Collaboration</li> <li>- Real time closed loop</li> <li>- Total Data Quality management</li> </ul>

Figure 5: Business Intelligence Maturity Matrix (Den Hamer, 2005)

Den Hamer (2005) describes the BI Maturity Matrix in great detail. A summary of his explanation of the three dimensions, BI-ambitions, BI-organisation and BI-architecture can be found in the following subsections.

#### 3.3.1. BI-ambitions

In the Business Intelligence maturity matrix the meaning of BI-ambitions is the link between the development of the overall organisation and the use of BI in the organisation. It compares the BI-strategy with the overall strategy. Den Hamer (2005) states that it does not matter that much at which level the BI-ambitions of an organisation are, as long as that level fits with the overall strategy. Beside of that the ambitions must also fit the level of the other dimensions. When for example the BI-ambitions of an organisation are at the intelligent level, although the BI-architecture still suffers at the local level, the organisation has to adapt their BI-ambition. Otherwise the implementation steps are too big and the chance that the implementation fails is high.

An organisation with a *local* level of BI-ambition focuses on the delivery of information to understand what is happening inside their organisation. Usually the reports cover a fixed period in time and are limited to one division.

A *coordinated* level of BI-ambition focuses on the steering of processes when certain factors are out of the norm. Therefore information is needed of different divisions. Besides steering an organisation can choose to reengineer business processes. This is called Business Process Reengineering (BPR).

The *integral* level of BI-ambitions focuses not only on efficiency of processes, but also on the optimal use of existing processes, customers, products, etc. It is important to have an integral view of the organisation. Information about opportunities and threats has to be sent proactively to the right people.

The highest level of BI-ambitions, the *intelligent* level, extends the other ones with aspiring innovation and creating new opportunities in a smart way. Therefore information is continuously analysed and proper actions are set up. External partners and customers also have access to a part of the BI-system.

### **3.3.2. BI-organisation**

The BI-organisation shows who is responsible for the projects and how they are organized. Also the management of Business Intelligence is captured in this dimension.

At a *local* level there is no BI-organisation. Project teams consist mostly of IT-people. These teams are created ad hoc.

The BI-organisation at a *coordinated* level makes use of a centralised project bureau. The steering of the projects is the responsibility of the IT-management. At this level the professionalism of the project teams is more important.

An *integral* level of the BI-organisation is characterised by multidisciplinary project teams. All BI initiatives should be combined in one BI competence centre (Dresner et al., 2002). All BI-activities are under control of the CIO or someone else of the top management. At this level advantages are also made through the reuse of models and parts of applications.

At the *intelligent* level the BI activities are bundled in a Shared Service Centre. This centre carries out BI-activities proactively. At this level BI is an important part of the strategy development and management of an organisation. Even the CEO knows the importance of BI.

### **3.3.3. BI-architecture**

The BI-architecture is the set-up and use of a unifying framework for all BI-applications. It consists of the infrastructure, tools and standards, shared metadata, topology and facilities for quality management and control.

At the *local* level there is no common architecture for all projects. There are local initiatives, but they have all their own infrastructure, metadata, tools, etc. Although this level has a lot of local flexibility it is more costly for the long term.

The *coordinated* level of the BI-architecture does have standardisation of tooling and infrastructure. This leads to a reduction in management and training costs of the tools. Besides that metadata can be exchanged between projects. At this level the separated data warehouses are merged into one enterprise data warehouse.

The *integral* level increases the standardisation to all areas of the BI-architecture. For example the methods for implementation and training are also standardised. The metadata is shared and is consistent in all applications. To ensure data corresponds to the metadata, data cleansing is necessary. At this level more complex analyses are also possible.

At the *intelligent* level of the BI-architecture BI is offered as a service. These services are very flexible and can be adjusted to the needs of each individual, both inside and outside the organisation. The focus is on total data quality management, which ensures data quality in the whole organisation. It is possible to make a real-time closed loop with other applications.

### 3.4. The Business Intelligence process

The process of BI consists of three important activities: collect, analyse and use. Collecting data is about bringing together all relevant data from different systems and databases inside and outside the organisation. Besides the actual collecting, the collect activity also concerns the cleansing and integration of data.

The analysis of this data is the process of converting it into valuable information. This can be done in several ways, for example by reporting or OLAP. Paragraph 3.7 discusses all these kinds of Business Intelligence features.

The use of Business Intelligence takes care of the presentation of this information in a way it is optimally used. It is also important to stimulate the use of this information in the steering process, as discussed in Chapter 2. This can be achieved by giving the users training and support.

### 3.5. User types

Inmon (1996) defines four types of users: farmers, tourists, explorers and miners. Farmers have a fixed information demand which does not change much over time. They have fixed reports which they use. It is important to regularly check the reports if they fit the demands. Tourists need, besides fixed reports, some interactivity to gather details. Explorers are looking for causes of problems and therefore combine data from several sources. They have no predictable information demand and want to have tools for interactive analysis. The information demand of Miners is the least predictable. They use all available information to search for complex relations.

### 3.6. Components of a Business Intelligence System

Kimball & Ross (2002) present an overview with basic elements of a Business Intelligence system. The components of Business Intelligence systems are Operational Source Systems, a Data Staging Area, a Data Presentation Area and Data Access Tools. A graphical overview of one of the possible architectures of all components can be found in Figure 6 on the next page. In the following sections each of these components will be discussed.

### 3.6.1. Operational Source Systems

In fact Operational Source Systems are not part of Business Intelligence, they only deliver information to the BI-system. Source systems can for example be an ERP-system, a CRM-system, a weather information system, etc. These systems are used to process data. The main priorities of them are processing performance and availability. (Kimball & Ross, 2002)

### 3.6.2. Data Staging Area

The Data Staging Area stores the information it gets from the Operational Source Systems. Besides of that it takes care of the cleansing of data. It combines data from different sources and puts it in a standardized format. This process is often called Extract-Transformation-Load (ETL). (Kimball & Ross, 2002) Most Business Intelligence packages have a limited ETL-tool. The most used standalone ETL-tool is Informatica. (Friedman, Beyer & Bitterer, 2006)

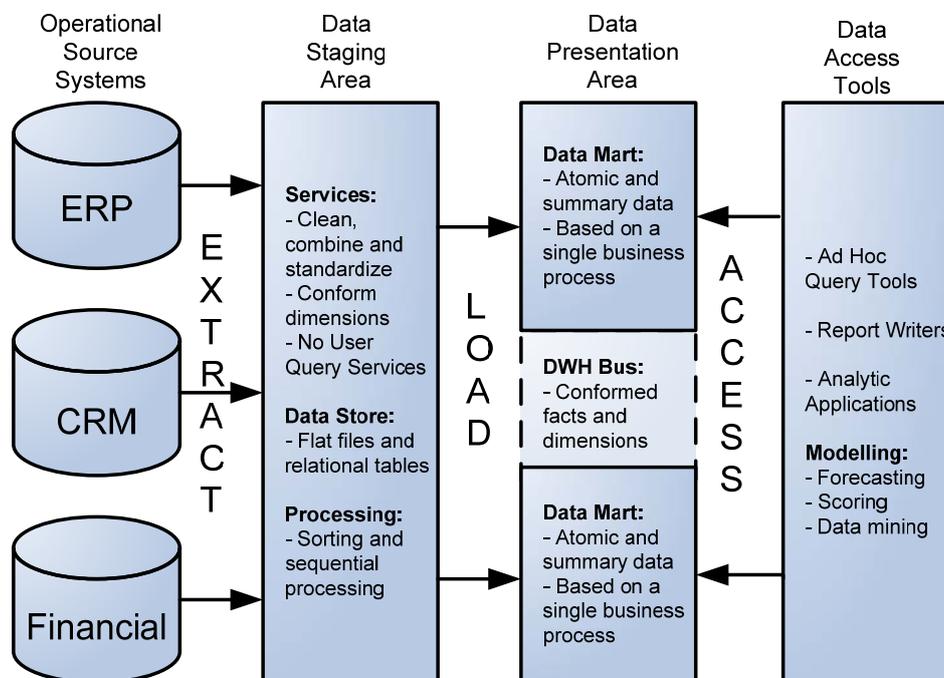


Figure 6: Architecture of Business Intelligence

### 3.6.3. Data Presentation Area

The Data Presentation Area consists of a data warehouse and several data marts. A data warehouse can be defined as: *"The conglomeration of an organisation's data warehouse staging and presentation areas, where operational data is specifically structured for query and analysis performance and ease-of-use."* (Kimball & Ross, 2002) A data mart is a part of the total data warehouse presenting a (part of a) business process.

The data in a data warehouse is modelled dimensional and not relational as in operational systems. This means there is one table with facts and several other tables with dimensions which are all linked to the fact table. In queries this leads to a high performance because the number of joins can be reduced. Another reason for the use of

dimensional modelling is the extreme simplicity the so called star schema's have. Everyone, from database analyst till end user, can read these kind of schema's after some basic training. (Kimball & Ross, 2002)

#### **3.6.4. Data Access Tools**

The Data Access Tools query data from the data warehouse and data marts. They also present the information that is filtered out of the data. There are several different tools, for example Business Objects, Cognos and MicroStrategy. Paragraph 3.7 discusses specific Business Intelligence features.

#### **3.6.5. Metadata**

Metadata is all the information in the data warehouse that is not the actual data itself. Each of the areas in the architecture can have metadata. The ultimate goal is to corral, catalogue, integrate and then leverage these kinds of metadata. (Kimball & Ross, 2002)

### **3.7. Business Intelligence features**

There are several Business Intelligence features; ways in which Business Intelligence can be used. Below these features are discussed successively.

- *Reports*  
Reporting is the most used and least complex form of Business Intelligence. Data is presented in tables or figures. In most Business Intelligence tools some selections can be made before a report is created.
- *OLAP*  
OLAP is the abbreviation of OnLine Analytical Processing. This feature can be used to answer ad hoc questions. Users can interactively 'slice and dice' through the various dimensions.
- *Data mining*  
Data mining does automatically find interesting facts about the data in the data warehouse. It uses very complex statistical methods. Although data mining can have a lot of benefits, it is still very costly.
- *Exception reporting*  
Exception reporting is a specific kind of reporting which only gives exceptions. For example only regions where an organisation has loss instead of profit are shown.
- *Dashboards*  
Dashboards present on one screen various information. The user can click on one of the parts in order to see more details on that specific area. A lot of tools have nice graphical options to present the information.
- *Automatic distribution*  
A lot of organisations, especially in the retail sector, have standard reports that users need each period. For example every store of a fashion organisation has to get its sales and profit information each week on Monday. Then the organisation can use automatic distribution of the reports for example via e-mail. This can reduce the number of peak hours enormously.

- *Alerts*  
Some information is so critical that a user directly wants to be informed about it. Therefore most Business Intelligence tools support alerting. An alert is only send when certain factors are above or beneath a certain value. Alerts can be send by SMS, e-mail etc.

### **3.8. Conclusion**

Business Intelligence can deliver the right information which is needed to steer processes. There are various different ways in which the information can be presented. A good way to measure the Business Intelligence level of an organisation is the Business Intelligence Maturity Model. This model is used in the empirical research in Part 2.

This chapter described the state of art in Business Intelligence and thus answered the first research question. Now the need for Business Intelligence and the state of art in Business Intelligence are described, the other factor of the research, the Retail sector, has to be researched. The next chapters will elaborate on this subject.

**“The secret of successful retailing is to  
give your customers what they want.”**

*Sam Walton (1918-1992)*

*Founder Chairman, Wal-Mart*

## **4. Overview of the Dutch Retail Sector**

In this chapter first the classification of the retail sector will be described. Thereafter the value chain of the retail sector is discussed. At last the specific retail processes are explained.

### **4.1. Definition**

The retail sector is very extensive. Not only stores or internet shops are part of it, banks, insurers, etc. belong to it as well (van der Kind, 2004). This research focuses only on the sales of physical products in traditional stores. Often this specific sector is called the Consumer Goods. In this thesis the term ‘retail’ is used, although only the sale of physical goods is meant.

### **4.2. Classification retail**

There are many different kinds of retail organisations and therefore it is good to make a classification. Van der Kind (2004) gives two different classifications: an operational classification and a classification in different kinds of purchase behaviour. Levy, Grewal, Peterson and Conolly (2005) make another classification, they set out relative offerings against relative price in their Big Middle theory. These three classifications are discussed below.

#### **4.2.1. Operational classification**

From an operational point of view the retail sector can be classified in: logistic oriented, sales oriented and purchase oriented retail. Of course retail organisations have to keep an eye on all aspects, but this classification shows the main focus of the organisation. In the following, each of them is discussed shortly.

In logistic oriented organisations the focus is on the flow of goods. The assortment is very stable. Availability of products is more important than innovation in new products. The contracts with suppliers are long-term. It is important to take care that both external (from suppliers to distribution centre) and internal (from distribution centre to stores) logistics are optimal. The margins are small and customers have to serve themselves. Groceries are an example of this type of retail.

Sales oriented organisations are more focussed on the organisation and maintenance of the flow of customers to the stores. The saleability of products is the most important in the purchasing process. The promotion of products in this kind of organisations is extremely high. The products are pushed towards the customers. In the Netherlands sales oriented organisations do almost not exist anymore (van der Kind, 2004). An example of a sales oriented organisations is a factory outlet.

Purchase oriented organisations renew their assortment continuously. The product categories are most of the time driven by trends. Before they buy, customers want to carefully explore the new trends. The focus in the purchase process is on the prediction of the fashion trends and the developments in customer behaviour. An example of this kind of retail organisation is a fashion shop.

#### 4.2.2. Shopping behaviour classification

Beside the operational classification, the retail sector can be divided in groups with different shopping behaviour of customers:

- Run shopping vs. fun shopping
- Daily vs. not-daily purchases
- Low involvement vs. high involvement purchase moments

In general the characteristics of the left site are linked to each other. For example, a store in which a consumer shops very fast, it is likely that it is also a store that he visits for daily purchases and that the involvement in the purchase moment is low.

In Figure 7 a matrix is shown where these groups are set out against the size of the assortment of the organisation.

Run - Shopping behaviour - Fun	Specialty goods (Fashion shops)	Shopping goods (Warehouses)
	Preference goods (Neighbourhood shops)	Convenience goods (Groceries)
	Small - Assortment Size - Big	

Figure 7: Classification of the Retail sector (Van der Kind, 2004)

This matrix shows four groups of retail organisations:

- Specialty goods: Stores with a small assortment and a fun shopping behaviour. For example Fashion shops.
- Shopping goods: Stores with a big assortment and a fun shopping behaviour. For example warehouses.
- Preference goods: Stores with a small assortment and a run shopping behaviour. For example neighbourhood shops.
- Convenience goods: Stores with a big assortment and a run shopping behaviour. For example groceries.

The fashion shops at one side and the groceries at the other side are opposites. In the empirical research of Part 2 these two types of retail organisations are mainly used. This classification on shopping behaviour can be converted to the operational classification. The fashion shops are more purchase oriented. In groceries the main focus is on logistics.

#### 4.2.3. Big Middle Segment

Levy et al. (2005) make a classification in four segments of retailers: Innovative, Big Middle, Low price and In trouble. This is summarized in Figure 8. The horizontal axes is the relative price, the vertical one the relative offerings.

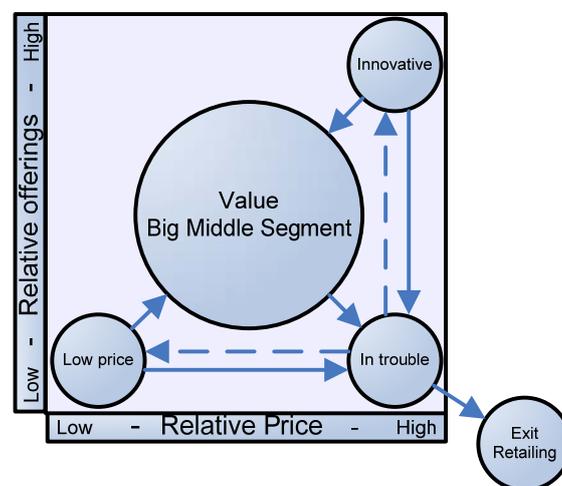


Figure 8: The Big Middle classification (Van der Kind, 2004)

Most retail organisations are in the Big Middle Segment. The Big Middle segment is desirable because of its revenue and profit potentials. (Levy et al., 2005) It is impossible to stay in the Big Middle Segment without doing anything. Retailers must add value to their activities in order to stay in the Big Middle Segment. (Grewal et al., 2006) The next chapter discusses ways to add value.

### 4.3. Retail Value Chain

The processes in retail can be analysed with the Value Chain model of Porter (1985). In his model Porter distinguishes primary activities and support activities. The primary activities are involved in the creation of the product, its marketing, its delivery to buyers

and its after sales support and service. Support activities provide the inputs and infrastructure that allow the primary activities to take place. (Porter, 1985)

Van der Kind has filled in this model for the retail sector in his book Retailmarketing (Van der Kind, 2004). He states that the primary activities in retail are Purchasing-Marketing, Inbound Logistics, Outbound Logistics and Store Operations. Secondary activities which are deployed to support the primary ones are Organisation, HRM, Technology and Real Estate Facility. The visual representation of this model is shown in Figure 9.

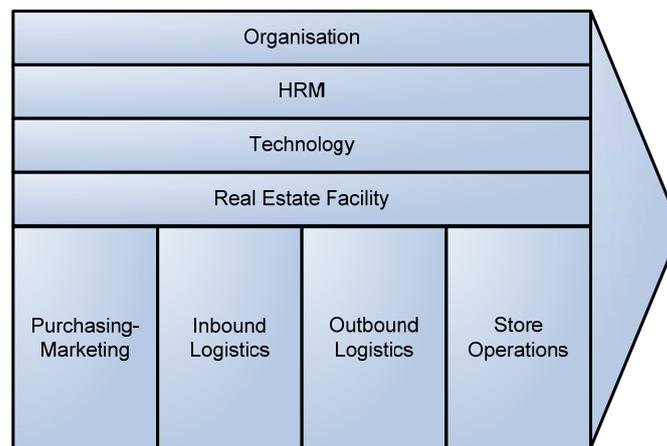


Figure 9: Value Chain of the Retail sector

In the following first the primary processes are described, thereafter the supportive ones. Also the need for information in each process is elaborated.

#### 4.3.1. Purchasing and Marketing

The Purchasing and Marketing activity consists of three processes which all ensure that the right product is at the right price and place in time. These processes are Purchasing, Marketing and Merchandising and are in most organisations combined in one or two departments. Therefore these processes are not separated in the value chain.

The Purchasing process takes care of the relationships with suppliers. They also ensure that there is sufficient inventory at the distribution centres to avoid out of stocks. Therefore they need to forecasts the quantity that is needed. Another subtask is the negotiation of contract terms with the suppliers.

The main goal of the marketing process is to get potential customers in the stores. Rajamani & Guha (2006) define several tasks which has to be fulfilled in this process:

- The analysis of customer trends is about watching trends at national (or even global) level and at individual customer level. To develop such trends sources of data are needed. These could be inside the company or from external sources (Levy & Weitz, 1991). In this field Customer Relationship Management (CRM) is used to restyle the organisation in a way that it is totally customer-centric.
- The development of the promotions calendar is the planning of all weekly price-cuts and other campaigns during the year. This calendar has to be communicated throughout the organisation, so every other department can take it into account.

- The development of the media mix consists of selecting the different ways in which the organisation communicates with its (potential) customers
- The design and run of campaigns is the actual elaboration of the campaigns. This includes the development of advertisements, folders, shelf labels, etc.
- The analysis of the effectiveness of the campaigns is a very important process, because future campaigns can be adapted to the results of this analysis. In this way the quality of the campaigns is guaranteed.

An overview of all processes of a large grocery retailer (Grocery 1, 2004) in the Netherlands tells us almost the same, although they assign other names to it.

Merchandising is about the choice of products that are offered. Also the price and place of the products are determined. Rajamani & Guha (2006) define the following sub processes: create financial plans, create product plans, create location plans and create assortment plans. The process overview of the large grocery (Grocery 1, 2004) shows us another important process: formula management. To stay in business a formula has to renew every 3 to 5 years. (van der Kind, 2004)

#### ***4.3.2. Inbound Logistics***

Inbound logistics takes care of the incoming goods at the distribution centres. Beside of that they also need to record all deliveries so the inventories in the system are up to date (Rajamani & Guha, 2006). In case of exceptions they have to notify the purchasing department.

#### ***4.3.3. Outbound logistics***

The outbound logistics activity gets orders from the stores and takes care of the picking of these orders. They also make an efficient planning of the shipments to the stores.

#### ***4.3.4. Store Operations***

The store operations process is the actual sales process. It is important that the stores take the plans from the marketing and merchandise departments into account. They have to ensure that every product is at the right place. Rajamani & Guha (2006) call this the presentation of the products. They further distinguish the processes train store staff, understand customer needs and the recommend, up-selling and cross-selling of products. Paco Underhill states that it is not possible to only look at the information from for example a Business Intelligence system. It is always important to observe the customers at the shopping floor. In his book he illustrates this magnificent. (Underhill, 2006) Store Operations also has to take care of the replenishment of the products. Nowadays this is more and more done by Automatic Store Replenishment (ASR) systems (Angerer, 2002).

#### ***4.3.5. Organisation***

The organisation process consists of the management of the organisation. Part of this is the controlling department which calculates where the organisation can perform better. In the retail sector this process is very important, because it delivers information to all other processes. It also looks at the primary and supportive processes in order to find inefficiencies.

#### **4.3.6. HRM**

The most important tasks of the HRM-department are Recruitment & Selection and Training & Development. Recruitment is the source or attraction of candidates. Selection is choosing about job candidates. Firms need to attract and nurture people with the kind of abilities that will make the firm productive in its market. Training and development plays a complementary role towards recruitment and selection. Training is about giving the right education to the right people. Development is about giving employees the chance to grow. Nowadays no one will work his whole life in the same function in one organisation. People want to develop and if it is not possible inside the organisation, than they will find their way elsewhere. Therefore opportunities to develop have to be created (Boxall & Purcell, 2003).

#### **4.3.7. Technology**

The task of this process is to ensure that there is appropriate technology, like IT, and that it is up and running. Grocery 1 (2004) makes the following arrangement of sub processes: IT Planning and Organisation, IT Acquisition and Implementation and IT Delivery and Support.

#### **4.3.8. Real Estate Facility**

This secondary process focuses on the buying of new offices, stores and distribution centres. It also takes care of the maintenance of the buildings. In case a building is not necessary anymore, they sell it.

### **4.4. Conclusion**

In this chapter retail classification and retail processes are discussed. In the classification of retailers, food retailers on one side and fashion retailers on the other side are opposites. It is interesting to see if the usage and maturity level of Business Intelligence in these two kinds of retail differs. That is one of the things that is researched in Part 2.

In the discussion of the processes in retail organisations it came to light that they can be divided in primary and supportive processes. The primary process consists of Purchasing/Marketing, Inbound logistics, Outbound logistics and Store Operations. This answers research question 3.

In order to be successful in retail, it is necessary that all primary and secondary activities run smoothly. But this is not enough anymore; the activities have to be integrated. Van der Kind (2004) calls this the 'swallow tailing' of the subsystems.

In all processes, information is needed to steer the process. This was already mentioned in Chapter 2. A complexity that arises is the integration of the processes. Because of this integration it is also necessary to deliver integrated information about all processes.

The next chapter elaborates the integration of processes and the demand of integrated information. Also other important trends are discussed.

**“The future belongs to those  
who prepare for it today.”**

*Malcolm X (1925 - 1965)*

## **5. Trends in the Dutch Retail Sector**

In the previous chapter an overview of the Dutch Retail sector is given. This overview shows the current situation of the Retail Sector in the Netherlands. In order to get a good insight on both the current and future use of BI in this sector it is necessary to look also at the trends in it. This chapter discusses these trends.

### **5.1. Integration of processes**

In the conclusion of the previous chapter the swallow-tailing in the value chain of the retail sector was already mentioned. In the first phase of this research two interviews with retail experts (van der Kind, 2007; Voogt, 2007) were carried out. One of the questions that was asked is: What is the most important process in retail organisations? Both of the interviewees answered that all processes are important and that the integration and steering of these processes is the most important.

This Integration and Steering process consists of two parts. The first is about steering each individual process in a way that quality is guaranteed. This is necessary because if one process suffers, the others can not perform either. The chain is only as strong as its weakest link. The second part consists of the integration of the individual processes. Each process can do his tasks excellent, but when the communication between the processes is not optimal the organisation will never outperform.

Therefore in Figure 10 this integration and steering process is added to the value chain.



Figure 10: Retail Value Chain with integration

To steer the individual processes and the above described integration and steering process, it is necessary to have accurate information about the processes. Therefore every department or process has to deliver data to the technology process, in more detail the Business Intelligence system. The Business Intelligence system combines this data in such a way that information comes into existence. The difference between data and information is discussed in Chapter 3. Of course every process and layer in the organisation needs different information, so the right information has to be send to the right person. In Figure 11 below this process is graphically shown.

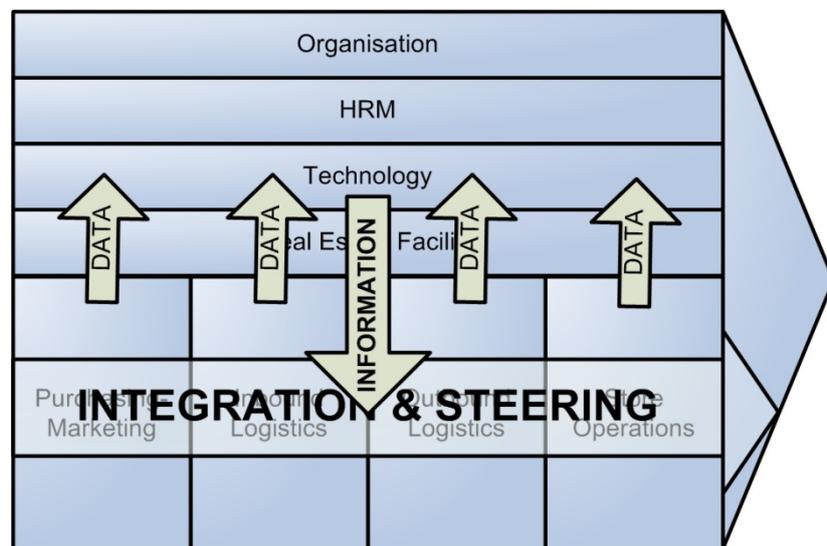


Figure 11: Retail Value Chain with data/information exchange

So this integration & steering process needs an enterprise-wide BI system to deliver integral information. When this information is used in the right way to steer the whole chain, the processes will run smoothly. This could lead to cost reductions or increased sales.

## 5.2. Adding Value

In Paragraph 4.2.3 the Big Middle classification is discussed. It is also mentioned that the only way to stay in the Big Middle is by adding value. Grewal et al. (2006) have defined six major levers for retail success through value:

1. Store factors
2. Service factors
3. Merchandise
4. Price
5. Supply Chain
6. Technology

One could think that BI can be used as technology lever, but as Grewal et al. (2006) already mention the technology lever goes hand-in-hand with the supply chain lever. Also the Merchandise and Price levers can be used optimally through Business Intelligence. A BI analysis can for example help at the merchandise area to calculate if it is profitable to add another brand of peanut butter to the shelves. An interesting question for the BI system in the price area is the most profitable price for the new peanut butter. So Business Intelligence is a good driver for adding value in the Big Middle Segment.

## 5.3. Retail Trends

It is interesting to look at the trends in the retail sector because they can predict the future need for Business Intelligence. Dawson (2006) has written an article about retail trends in Europe. He states that European retailing is restructuring rapidly from a reactive to a proactive sector. The characteristics of this restructuring are summed up below. For each characteristic the relevance for Business Intelligence is given.

- *Fast growth of large firms*  
This implicates that the amount of data that is in the firms will grow either. Business Intelligence helps to structure this data and transform it into valuable information.
- *A more strategic approach to managerial decision taking*  
In the past most decisions of retail managers were made on ad hoc basis (Dawson, 2006). When this changes to a more strategic approach it is essential to have the right information about the retail processes.
- *More complex organisational structures*  
This characteristic goes hand in hand with the first one. When the organisations grow, they will also be more complex. As already said, Business Intelligence is needed to structure the data and transform it into valuable information.
- *More retailer coordinated value chains*  
This value chain is meant to be the whole chain; suppliers, partners and customers included. When retailers coordinate these value chains it is essential that they also have information about the whole chain. Business Intelligence

should thus not only capture the whole organisation, but the whole inter organisational value chain.

Beside these characteristics Dawson (2006) also gives some future trends of retailing in Europe. These are presented in the following. On these trends also the relevance for Business Intelligence is given.

- *Continued innovation*  
In order to know in which direction an organisation should innovate, information is needed about the processes, suppliers, markets and customers. Therefore Business Intelligence can be used. Also results of new innovations can be determined by Business Intelligence. For example the percentage of customers which use the new self-scanning check out systems in a grocery organisation can be determined, but also the average spending of them.
- *Greater retail control of branding*  
This trend follows from one of the characteristic above, namely more retail coordinated value chains. Retailers have the power to select other suppliers and can force them to fulfil several requirements. One of those requirements could be the sharing of information via Business Intelligence.
- *Development of the experience innovation*  
With the development of the experience innovation is meant involving customers in developing a shopping 'experience'. Dawson (2006) states that the local retailers can profit the most of this trend if they know their customers. In this trend Business Intelligence does not play a major role, because this trend mainly focuses on the soft side of retailing.
- *A steady exploitation of economies of scale and scope*  
All retailers will continue to grow in order to maintain their profitability. When Laurus in January 2006 declared it wanted to sell its EDAH and Konmar groceries, all other retailers where fighting like tigers to get them. In this exploitation of economics of scale and scope the Business Intelligence system should be able to handle the growing amount of data.

At the end of his conclusion Dawson (2006) states: *"Several of the changes will require applications of convergent information and communication technologies to facilitate the managerial processes that will generate the change."* Business Intelligence is needed to deliver the right information in time. It is nice that Dawson, as retail expert, underpins this need for Business Intelligence.

## 5.4. Conclusion

The integration and steering of all processes is the most important process in the retail sector. This answers research question 4. In this integration and steering process it is essential to get the integral information on time. Therefore Business Intelligence has to be organisation wide.

It is important to add value in order to stay in the Big Middle segment of the retail sector. In this chapter six ways for adding value are presented. In four of them Business Intelligence plays a major role. Therefore it is necessary to continue to invest in Business

Intelligence otherwise the organisation will be 'in trouble' or even 'exit retailing'. (see Figure 8 in Chapter 4)

All trends described in this chapter can be summarized to three major trends which affect the need for Business Intelligence:

1. *Ongoing innovation*

In order to stay in business, it is essential to continuously look for improvements in the processes, products and service. Business Intelligence gives insight in the current situation of the organisation and can with more advance features also predict the effects of changes.

2. *Supply chain integration*

As described in the first paragraph of this chapter, integration of all processes in the supply chain is very important in the Retail sector. The Big Middle segment theory also says chain integration is one of the ways to add value. From the retail trends that are discussed in Paragraph 5.3, it can be concluded that this integration goes over the boundaries of the organisation. Also suppliers, customers and partners should be integrated in the process. In order to steer this integration of processes, information is needed. Business Intelligence delivers this information. But therefore the Business Intelligence system needs a data warehouse in which data of the whole chain is loaded.

3. *Increasing complexity*

Retail organisations are expanding and therefore the complexity of the organisational structure increases. In such a complex environment it is not possible anymore to get the right information in time from operational systems. Therefore an integrated Business Intelligence system is needed.

In order to follow these trends information is needed about the own organisations, but also information about suppliers, partners, the market and customers. Business Intelligence is indispensable in delivering this information. The Business Intelligence system has to develop towards a more chain oriented system in which all information is accessible. In the next part of this thesis empirical research is done in order to see if Business Intelligence is used in this way.

## **Part 2: Empirical Research**

**“Let us watch well our beginnings,  
and results will manage themselves.”**

*Alexander Clark*

## **6. Research Design**

In Part 1 theory on Business Intelligence in the retail sector is discussed. Part 2 describes the empirical research which is carried out towards this subject. In this chapter the design of the research is elaborated. The next chapter presents the results.

### **6.1. Research method**

Case study analysis is chosen as method for this research. Because the research will be exploratory, this is the most suitable method (Yin, 2003). Yin (2003) has written a whole book about Case Study Research. This book is used as guideline in the set up of this research. He defines four phases in the research:

1. Design
2. Data Collection
3. Analysis
4. Reporting

The Design and Data Collection phases are elaborated in this chapter. The results of Analysis and Reporting are presented in the subsequent one.

According to Yin (2003) the design of the research consists of five components:

- Research questions
- Propositions (hypothesis)

- Unit of analysis
- Logic linking of the data to the propositions (constructs)
- Criteria for interpreting the findings

In the following each of those components is discussed successively.

## 6.2. Research questions

The Introduction describes the research questions of this research. Some of them are already answered with the theory in Part 1. These questions are printed in gray. The questions that are still open will be answered in this research part. This concerns the following questions:

1. What is the state of art in Business Intelligence?
2. How can retail organisations be classified?
3. What does the primary process in retail organisations look like?
4. What part of the retail process adds the most to the overall performance?
5. What are the trends in the retail sector?
6. What does the business case of Business Intelligence systems in retail look like?
7. Which Business Intelligence features are used in retail?
8. What is the Business Intelligence maturity of retail organisations?
9. To what extent is Business Intelligence used in retail?
10. What are the differences of the maturity and use of Business Intelligence between food retail and fashion retail?
11. To what extent do the maturity and use of Business Intelligence in retail organisations differ from theory?
12. To what extent will trends in the retail sector influence the Business Intelligence maturity and use?

## 6.3. Hypotheses

There are several hypotheses for the research. These are tested in the next two chapters. In this paragraph they are discussed successively. Also the exact place where the hypotheses are tested is given.

*H1: Business Intelligence is more used in Groceries than in Fashion stores.*

There is a major difference between food retailing and fashion retailing. Groceries on the one side have a relative stable assortment. There are some fluctuations in seasons and some new product introductions, but most of the assortment does not change. On the other side fashion stores are changing the full assortment each season except for some basic products. This makes it more difficult for fashion stores to use BI for product and

trend analysis. Therefore BI will be used more in groceries. This hypothesis is tested in Paragraph 8.2.

*H2: Business Intelligence is more used in organisations in the Big Middle segment than in Innovative organisations.*

The competitive pressure in the Big Middle segment is much higher than in the Innovative segment. Therefore organisations in the Big Middle segment have to add value to their business in order to stay there. As discussed in Chapter 5 there are several ways to add value. In most of these ways Business Intelligence plays a major role. Organisations in the Innovative segment have to innovate. Business Intelligence can help them, but there are also several other ways for innovation. Therefore Business Intelligence will be more used in the Big Middle segment. This hypothesis is tested in Paragraph 8.2.

*H3: Most retail organisations did not have a formal initial business case.*

A BI system is for most organisations a replacement investment of reports from operational systems. Therefore it was not necessary to make an initial business case. Beside of that the implementation is in most of the organisations an ongoing process. So a formal initial business case will not be available. This hypothesis is tested in Paragraph 7.1.

*H4: Business Intelligence is mainly used for reports and analyses.*

There are many different Business Intelligence features as Paragraph 3.6 discusses. Traditional retailing is about steering on a fixed number of financial indicators: sales, profit margin and several variations on both. It is expected that BI is used mainly for delivering such financial indicators in reports. But nowadays it is very important in the retail sector to ensure that all processes run smoothly (Paragraph 5.1). Therefore it is necessary to know where the bottle necks are. This can be analysed by OLAP analyses or data mining. The investments for data mining are very high, so most organisations will use OLAP. The recent features (automatic distribution, exception reporting, alerts and dashboards) will still not be used that much, because most organisations are followers. They first want to know if the feature works in other organisations. Therefore the focus in the use of Business Intelligence will be on reports and analyses. This hypothesis is tested in Paragraph 7.4.5.

*H5: Most organisations are on the "Coordinated" level in the BI maturity matrix.*

Although all organisations know Business Intelligence is very important for their organisation, they are followers in this area. The major investments will hold them back. Therefore most organisations will be at the coordinated level in the BI maturity matrix. This hypothesis is tested in Paragraph 7.3.

*H6: Trends in retail will cause a more heavy use of the BI system.*

As seen in the theory part, Business Intelligence is needed to fulfil the needs for information. The information need is still growing because of trends in retail. Therefore the Business Intelligence systems will be used more heavy. This hypothesis cannot be tested through this research. But it will be tested with reasoning towards the future. This is done in Paragraph 8.3.

## 6.4. Units of analysis

The research is done in ten organisations in the retail sector. These ten organisations are spread over the retail sector with a focus on groceries and fashion stores. As elaborated in Chapter 4 these two kinds of retail are opposites

To get a good case study of the organisations, it is necessary to speak with the right people. Therefore in each organisation interviews are held with a BI-manager, a BI-employee and two end users. In case there was no BI-manager, the IT-manager or Information manager is interviewed. The specific questions for each role can be found in the Appendices A till C.

## 6.5. Constructs

In order to analyse the interviews in a proper way constructs are set up. A construct is a dimension of BI in an organisation. Each construct is defined in this section. Also different levels and measurements to determine the levels are linked to the construct. After the analysis of the interviews with the constructs these constructs are combined to see relationships between them.

As stated earlier four interviews are held in each organisation. Because each of the interviewees has a different viewpoint, the results are more reasonable. But this advantage has also a drawback namely interviewees can do contradictive statements. Therefore the following general guideline is set up to handle such cases:

1. When all interviewees have said the constructor or measurement is at a certain level, we take it to be true.
2. When some interviewees have said the constructor or measurement is at a certain level, but others did not say anything about it then we look at the function of the interviewees:
  1. When the manager or BI-employee says it is at that level, we take it to be true.
  2. When two end users say it is at that level, we take it to be true.
  3. When only one end user says it is at that level, we take it to be false.
3. When some interviewees have said the constructor or measurement is at a certain level, but others say it is not then we look also at the function of the interviewees:
  1. When the manager or BI-employee says it is that level, we take it to be true.
  2. When two end users say it is at that level, we take it to be true.
  3. When only one end user say it is at that level, and the manager and BI-employee say it is not there, we take it to be false.

In this guideline one can see that the voice of the manager and BI-employee count more than the voice of the end users. This can be explained by the fact that the manager and BI-employee look from a wider perspective than end users. Of course sometimes the end

users will be right, in that case the level is determined on basis of the statements of the end users. When this situation occurs, it is mentioned and a reasonable explanation, based on valid arguments, is given.

### **6.5.1. General constructs**

There are several general constructs that characterise an organisation. In this research the following general constructs are used.

#### *Sector*

The sub sector of the total retail sector in which an organisation operates. This data is retrieved from the interviews and the website of the organisations.

#### *Stores*

The number of stores an organisation has, gives insight in the size of the organisation. This number of stores is retrieved from the websites of the organisations. The first intention was to measure the size of the organisations by the sales over 2006. However it is impossible to find these key financial numbers for all organisations. The big organisations hide their sales in the holding sales, the small organisations do not have a public annual report.

#### *Start BI*

The year in which the organisation started their BI activities. This data is also directly retrieved from the interviews.

#### *BI tool*

The BI tool the organisation uses. This data is directly retrieved from the interviews.

### **6.5.2. Classification**

In Paragraph 4.2 three classifications of the retail sector are made. Two of them, the operational classification and the classification on shopping behaviour, can be combined into one constructor. The explanation for this is already given in Paragraph 4.2.2. In the empirical research this constructor is measured by the sector which is already a general constructor in the previous paragraph. The results of this measure are derived from the interviews and the website of the organisation.

The other classification, Big Middle Segment, is another constructor in this research. The two measurements for this constructor are relative price and relative offerings. It is not easy to measure those relative scales individually. Therefore all organisations are placed in the matrix relatively to each other. The data for making funded decisions is derived from the interviews and the website of the organisation. If one organisation for example sells only its own quality designed products at a, relatively to the other organisations, high price it is in the innovative segment.

### **6.5.3. BI Maturity Matrix**

In Chapter 2 the BI Maturity Matrix is discussed. This matrix distinguishes three dimensions (ambitions, organisation and architecture) at which an organisation can be ranked in one of the four levels: local, coordinated, integral or intelligent. Den Hamer (2005) gives good measures for every level in each dimension. These measures are already presented in Figure 5 in Chapter 2. When an organisation fulfils the majority of

the measures of a level it gets a 2. If the measures of a level partly are fulfilled it gets a 1. If none of the measures are fulfilled it gets a 0.

#### *6.5.4. Usage level*

It is important that Business Intelligence is not only available, but that it also is used. So it is good to look at the expectations of the users with regard to BI. Therefore this segment of constructors is added. In this segment there are five constructors: type of users, usage at steering levels, captured processes, integration of processes and the use of the Business Intelligence features. The guideline of these constructors is the opposite of the guideline described above. The voice of the end users is the most important in this construct.

##### *Types of users*

Chapter 3 describes four types of users: farmers, tourists, explorers and miners. The presence of each of those types is marked by 0, 1 or 2:

0: not present

1: there are some of this user type, but it is not widespread in the organisation

2: there are a lot of those users, this user type is part of the organisation

##### *Usage at steering levels*

In Chapter 2 three levels of steering are described: strategic, tactical and operational. When BI is used at each of the steering levels, the advantage of BI is maximized. Each of those levels is a constructor in this research.

The use of BI at each of those levels is marked by 0, 1 or 2:

0: no usage

1: there is some usage at this level

2: there is a lot of usage at this level

A problem that arises on tactical and operational level is that the use of BI differs in each process. When the majority of the processes uses BI at the specified level of steering the constructor has the value 2, when some use BI it is 1, when it is not used it is 0.

##### *Captured Processes*

In Chapter 4 the retail processes are described. Each process is a constructor for this research. When BI is used in the process, the constructor is satisfied. This is marked by the number 1.

##### *Integration of processes*

The integration of the chain of processes is another constructor. This constructor can have three values:

0: No integration of processes, every process has its own analyses and reports.

1: There is some integration. For example two processes are integrated.

2: Full integration, the whole chain is integrated and there are reports and/or analyses over this chain.

#### *Used BI Features*

In Chapter 3 features of BI are discussed. These features are: Reports, OLAP, Datamining, Exception Reporting, Dashboards, Automatic Distribution and Alerts. Each of those features is a constructor in this research. When the feature is used the constructor has the value 1, otherwise 0.

## **6.6. Quality assurance**

As Yin (2003) says in his book it is difficult to prove implications from qualitative analyses, because most people think it is not a good research method. On the other hand he states that other kinds of research like quantitative analyses or experiments can also be carried out not very carefully.

In research it is important to maximize four conditions related to design quality (Yin, 2003):

### *1. Construct validity*

Construct validity is about establishing correct operational measures for the constructs being studied. Construct validity is in this research realised by the extensive description of the constructs and measures in the previous paragraph (6.5).

### *2. Internal validity*

Internal validity is about establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships. Internal validity is justified by the use of the NVivo software. In this way every implication made, can be lead back to different sources of evidence.

### *3. External validity*

External validity is about establishing the domain to which a study's findings can be generalised. External validity is realised in the description of the theoretical framework in Part 1 an the links that Part 2 makes towards this framework.

### *4. Reliability*

Reliability is about demonstrating that the operations of a study can be repeated with the same results. The described procedures and constructors as described in this chapter give reliability to the research. If someone else uses the same dataset and the described procedures and constructors, the same results should arise.

The research design fulfils all four conditions. This makes clear that the research is built in a proper way.

## **6.7. Conclusion**

This chapter has given a clear design of the research. Hypotheses are clarified and constructs are set up. Now there is a proper research design, it is possible to go to the actual results. The next chapter discusses these results.

**“Results! Why, man, I have gotten a lot of results.  
I know several thousand things that won't work.”**

*Thomas A. Edison (1847-1931)*

## 7. Research Results

In this chapter the results of the research are presented. Successively the results of the general constructs, the classification, the BI maturity constructs and the usage level constructs are given. Also implications of the results are given. In the next chapter possible relationships between those constructs are researched.

### 7.1. General constructs

The results of the general constructs, as described in the previous chapter, can be found in Table 1. As already described in Paragraph 6.5.1, the results of this constructs are retrieved from the interviews. The number of stores comes from the website of the company.

**Table 1: Results of the general constructs**

Organisation	Sector	Stores	Start BI	BI tool
1	Food	700	1999	MSTR
2	Fashion	350	1997	MSTR/BO
3	Warehouse	15	1995	BO
4	Food	360	1997	MSTR
5	Fashion	230	2001	MSTR
6	Fashion	40	2007	none
7	Fashion	185	2006	BO
8	Wholesaler	15	2003	MSTR
9	Food	460	1998	BO
10	Fashion	225	2001	MSTR

There is a lot of difference in the number of stores the organisations have. One can see that the warehouse (3) and the wholesaler (8) have the least stores. Although they only have such small number of stores they serve all areas of the Netherlands. This is because

these shops are very large and attract customers from a wide area. Organisation 1 has in the food sector the most stores; organisation 4 has only half of them. Organisation 9 is in the food sector in between. In the fashion sector there is a major difference in the number of stores. Organisation 6 only has 40 shops, although organisation 2 has 350. The others are in between. It is interesting to see that the smallest organisation (6) not yet has a BI tool. This can be explained by the general trend that BI is especially interesting for larger organisations. That this organisation has started this year with a BI implementation can indicate there is a turning point in this trend.

The start of BI varies a lot over the organisations. The first organisation (3) started already in 1995, while the latest organisation (6) started this year.

Almost all organisations (9 out of 10) have a tool for BI. Five of these organisations use MicroStrategy (MSTR), three use Business Objects (BO) and one uses both. Organisation 6 does not have a tool yet. They just started the implementation and did not made a tool selection yet.

One of the questions that was asked to the interviewees, is how their initial business case for Business Intelligence looked like. Most of the organisations (9 out of 10) did not made an initial business case. One reason is that the organisation had to implement Business Intelligence because of the holding organisation it is part of (organisations 2, 8 & 10). Another reason is that Business Intelligence was implemented as substitute for the reporting tool of operational systems (organisations 3 & 4). Or that the Business Intelligence tool was the reporting tool of the operational system (organisations 7 & 9). In both situations a formal initial business case was not necessary. Organisations 1 and 5 did not have a formal initial business case because changes in business strategy needed a Business Intelligence system. Only organisation 6 will maybe have a formal business case, but that is not clear yet. This proves that H3: Most retail organisations did not have a formal initial business case is true.

As discussed above there is a lot of variance in the general constructs. It is interesting to see how this influences the maturity and usage of BI. After the discussion of the other research results in the remaining of this chapter, these relationships are researched in the next one.

## 7.2. Classification

With the construct sector from the previous paragraph the organisations can be classified as in chapter 4. Almost all organisations could be placed in a segment on basis of their sector, because their sector is used in the figure as example. Only organisation 8 has got a different treatment. Because it is a wholesaler, he is placed in the convenience goods segment. The assortment of a wholesaler is big, and the behaviour is focussed on run shopping.

In Figure 12 below, this classification is shown. This makes the differences between the different organisations clear. On the upper left side we see the fashion shops, on the lower right side the groceries.

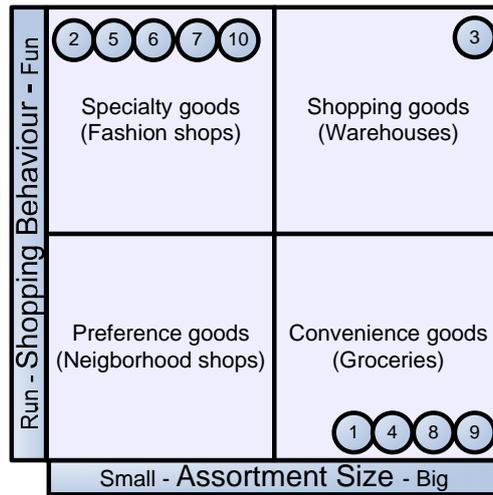


Figure 12: Classification on shopping behaviour

As already discussed in chapter 4 the groceries are more logistic oriented organisations and the fashion shops are more sales oriented organisations. Maybe this difference influences the need for BI.

Beside the segmentation on shopping behaviour, the organisations can also be placed in the 'Big Middle' segmentation of Paragraph 4.2.3. Organisation 3, the warehouse, is in the innovative segment, because it sells only high quality products at relatively high prices. Almost all fashion shops are in the innovative segment, because they also deliver high quality products at relatively high prices. Two of the fashion shops are placed in the Big Middle Segment because they offer relative less qualitative products for relative lower prices. Figure 13 presents the results of this Big Middle classification.

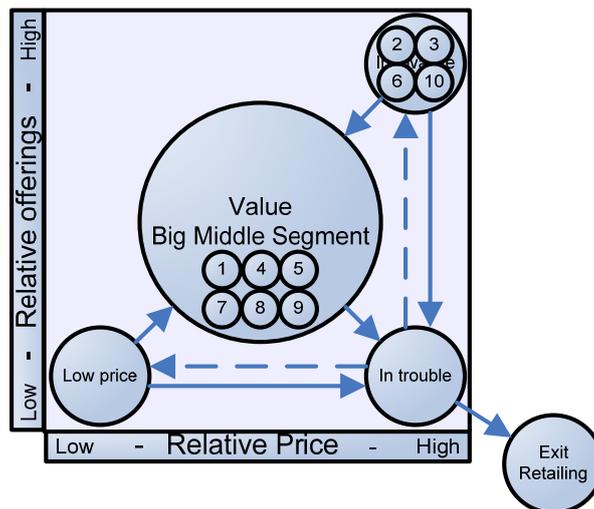


Figure 13: Big Middle classification

Organisation 8, the wholesaler, is in the Big Middle segment because it offers standard products at relative low prices. All groceries are in the Big Middle Segment, because they all offer almost the same products at most of the time comparable prices. Of course there are some variations in offerings and price. Organisation 1 has for example a very large assortment and good service for a competitive price. Organisation 4 has also a

large assortment and good service but the prices at organisation 1 are 6 percent lower (Consumentenbond, 2007). Organisation 4 has to do something in order to stay in the Big Middle Segment, otherwise it does not add value anymore and will sooner or later be "In Trouble" (Grewall et al., 2006). Organisation 9 has a smaller assortment and less service than organisation 1 although the prices are only 1 percent lower (Consumentenbond, 2007). This organisation also has to add more value in order to stay in business. Business Intelligence can help these organisations to analyse the problem areas. In order to make a good analysis it is necessary to have an integral BI system.

### 7.3. BI Maturity Matrix

In Table 2 the organisations are putted in the BI Maturity matrix. Each organisation is linked in each dimension to one of the four levels. An organisation can be fully or partly at a certain level. The numbers have the following meaning: partly local=1, fully local=2, partly coordinated=3, fully coordinated=4, partly integral=5, fully integral=6, partly intelligent=7 and fully intelligent=8. The last column is the sum of the three dimensions. The explanation for the classification can be found in appendix D.

Table 2: Results of Business Intelligence Maturity

Organisation	BI-ambition	BI-organisation	BI-architecture	Total BI maturity
1	8	7	7	22
2	5	4	3	12
3	5	4	5	14
4	5	4	6	15
5	5	4	3	12
6	4	1	1	6
7	4	3	2	9
8	6	5	5	16
9	6	3	2	11
10	4	3	3	10

In order to see if the three dimensions are valid constructs for the BI Maturity, Cronbach's Alpha (Cronbach, 1951) is calculated in the SPSS software. The value for Cronbach's Alpha of the three dimensions is 0.903. Most researchers use 0.70 as minimal reliability, so the three dimensions are valid constructs for the BI Maturity.

Beside the validity it is also interesting to know if there is a correlation between the three constructs. This can be determined by calculating the Pearson Correlation using the SPSS software. This results in a value of 0.840 for the correlation between BI-ambition and BI-organisation, 0.862 for the correlation between BI-organisation and BI-architecture and 0.678 for the correlation between BI-ambition and BI-architecture. The first two correlations are significant at the 0.01 level, the last at the 0.05 level. Although that last correlation is less significant, it can be concluded that there is a correlation between the factors in the BI Maturity Matrix.

In Figure 14 the Maturity levels of the ten organisations are presented in a diagram. Also the total Business Intelligence maturity level of the organisations is given.

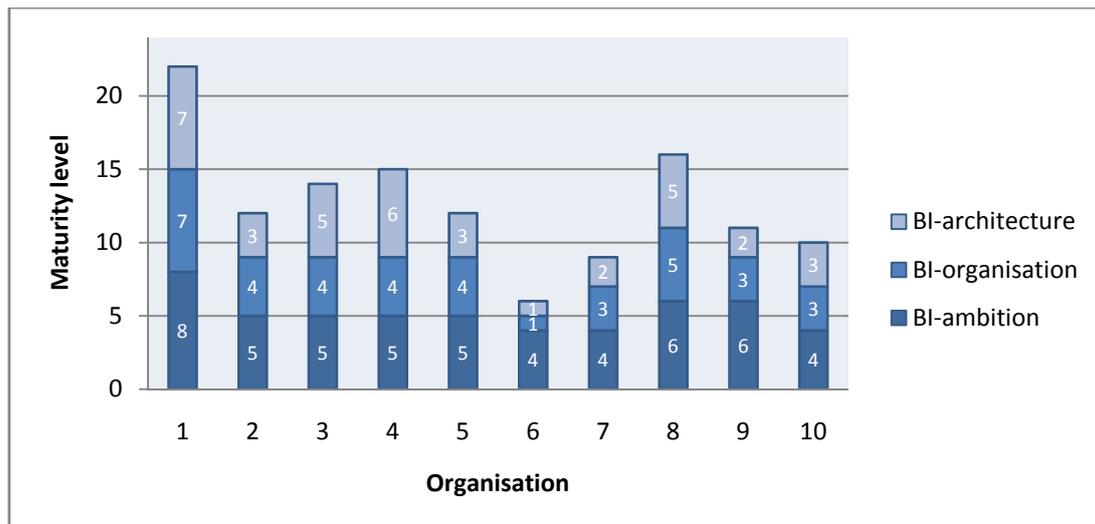


Figure 14: Results of Business Intelligence Maturity

Almost all organisations have their BI-ambition on a higher level than the other dimensions. It is good that the ambitions are at a higher level, because the BI-ambitions are leading for the other dimensions.

As den Hamer (2005) describes it is necessary to be almost on the same level in each dimension. It is interesting to see that some organisations have major differences in the levels of the three dimensions. In the following specific remarks on organisations are made, it is also checked if the statement of den Hamer (2005) is underpinned.

Organisation 1 is in all three dimensions at the intelligent level. Although the ambition is higher than the architecture and organisation, it does not differ that much.

Organisation 2 does have an integral ambition, but the architecture is still at the coordinated level. One of the reasons for this is that this fashion organisation has a retail part and a production part. These two parts use both their own BI-package. Because the organisation is part of a large corporation which wants to have one BI solution, the two parts cannot easily be combined.

Organisation 4 has a BI-architecture on the Integral level, although the BI-ambitions and BI-organisation suffer in respectively the local and coordinated level. From the interviews in organisation 4 can be concluded that they know that there is a problem. They see that the ambition level and the organisation level have to increase in order to be successful in BI.

Organisation 9 has the opposite problem of organisation 4. They have their ambitions and organisation on the integral level although the architecture is still on the local level. They are busy in setting up a new integral BI-system at this moment.

The overall average of maturity in all ten organisations is 4.23. This means retail organisations are on average at a Coordinated level of Business Intelligence maturity. This results in a positive test of hypothesis 5: Most organisations are on the "Coordinated" level in the BI maturity matrix.

## 7.4. Usage level

In the previous paragraph the BI maturity is discussed. To get an overview of the use of Business Intelligence in the retail it is also important to look at the different usage constructors. Therefore in this paragraph the results of the several usage constructors from Chapter 6 are presented.

### 7.4.1. User types

In Table 3 the results of the different user types are presented. The explanation of the classification can be found in Appendix E.

Table 3: Results of the user types

Organisation	Farmers	Tourists	Explorers	Miners	Total
1	2	2	2	1	7
2	2	1	1	0	4
3	2	2	2	1	7
4	2	1	1	0	4
5	2	1	1	0	4
6	1	0	0	0	1
7	2	1	0	0	3
8	2	0	1	1	4
9	2	0	1	0	3
10	2	0	0	0	2

In Figure 15 the total scores of the different user types are presented. All organisations have Farmers in it. Tourist and Explorers are only present in half of the farms. Miners are the scarcest, only three organisations have some of them.

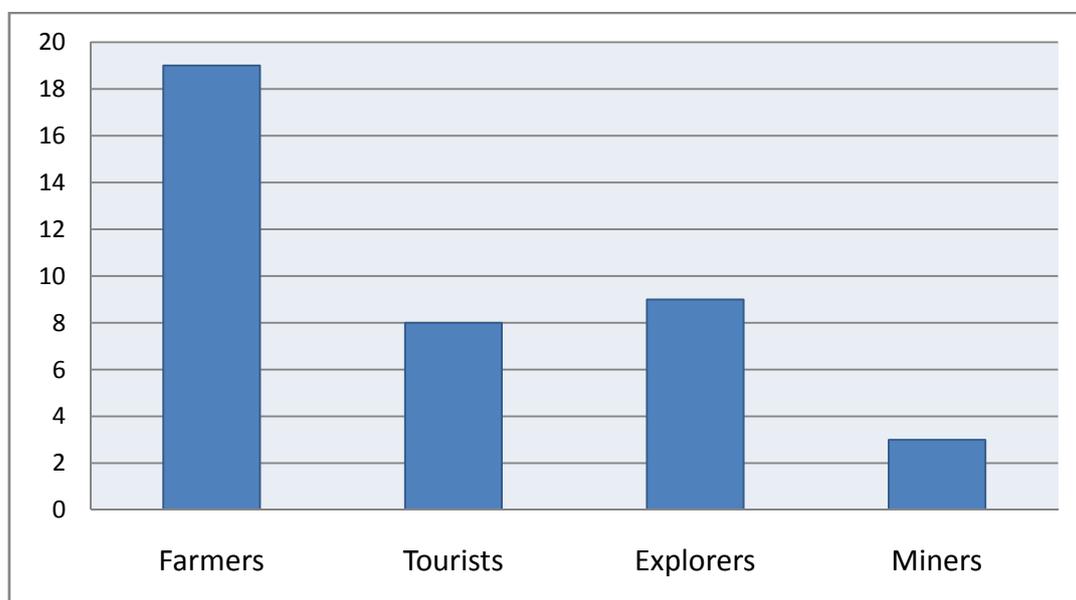


Figure 15: Results of user types

### 7.4.2. Usage at steering levels

In Table 4 the results of the usage at each of the three steering levels is given. In appendix E an explanation for the classification is given.

Table 4: Results usage at steering levels

Organisation	Operational	Tactical	Strategic	Total
1	2	2	2	6
2	1	1	2	4
3	1	2	2	5
4	1	1	1	3
5	1	1	1	3
6	0	0	1	1
7	1	1	0	2
8	1	2	2	5
9	1	1	1	3
10	1	1	1	3

Only one of the organisations (1) uses Business Intelligence fully at all steering levels. The other organisations use Business Intelligence also at all steering levels, although it is not always fully used. One organisation (6) only uses Business Intelligence partly at the strategic level. As already said, this organisation just started to implement Business Intelligence.

#### 7.4.3. Captured processes

In Table 5 the results of the constructor captured processes are presented. When BI is used in the specified process, a 1 is given, otherwise a 0.

Table 5: Results of captured processes

Org.	Purch/Mark	Inb. Log.	Outb. Log.	Sales	Organ.	HRM	Techn.	Real est.	Total
1	1	1	1	1	1	0	1	1	7
2	1	0	1	1	1	0	0	0	4
3	1	1	1	1	1	1	1	-	7
4	1	1	1	1	1	1	1	0	7
5	1	1	1	1	0	0	0	0	4
6	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	1	1	8
8	1	1	1	1	1	0	0	0	5
9	1	1	1	1	1	0	0	0	5
10	1	0	0	1	1	0	1	0	4

Figure 16 on the next page shows the percentage of organisations which uses Business Intelligence in the various processes.

It is interesting to see that the primary processes are supported in almost all organisations. Also in the supportive process 'organisation' BI is used very often. This can be explained by the fact that the Controlling department has a major function in most retail organisations. They take a look at the primary process of the organisation and try to optimise it. Of course they need sufficient information for that.

It is also interesting that only half of the organisations use BI in the technology process. This is remarkable, because the IT department delivers the BI system and should know the advantages of it.

The HRM and Real Estate processes make the least use of the BI system. An explanation for this can be the fact that they are more individual processes.

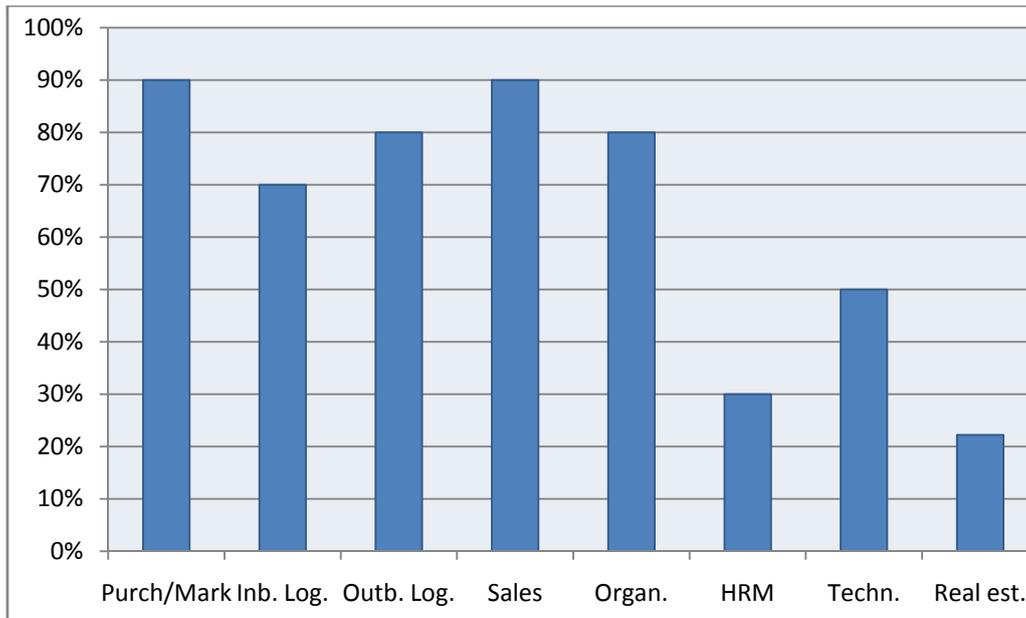


Figure 16: Results of captured processes

#### 7.4.4. Integration of processes

Beside the use of BI in individual processes, it is also good to look at the use of BI in the integration of processes. Integration is the added value in the retail chain, as mentioned in Chapter 5. In Table 6 the level of use of Business Intelligence in the integration of processes is presented.

Table 6: Results integration of processes

Organisation	Integration
1	2
2	0
3	1
4	2
5	1
6	0
7	1
8	1
9	0
10	0

Although Chapter 5 discusses that the use of Business Intelligence in the integration of processes is very important, in 4 of the 10 organisation it is not used in that way. Two organisations use Business Intelligence fully for the integration of the processes. The last four organisations use Business Intelligence only partly for integration purposes. It is important for organisations to make such usage possible in order to stay in business.

#### 7.4.5. Used BI features

The last constructors which determines the usage level are the used BI features. In Table 7 the results of these BI features are presented.

Table 7: Results of used Business Intelligence features

Org.	Reports	OLAP	Datamining	Exception	Dashboards	Distrib.	Alerts	Total
1	1	1	0	1	1	1	0	5
2	1	1	0	0	1	0	0	3
3	1	1	0	1	1	1	1	6
4	1	1	0	1	1	0	0	4
5	1	1	0	0	0	0	0	2
6	1	0	0	0	0	0	0	1
7	1	1	0	0	1	0	0	3
8	1	1	0	0	0	0	0	2
9	1	1	0	0	0	0	0	2
10	1	0	0	0	0	0	0	1

In Figure 17 the percentage of the organisation that use the different BI features is shown.

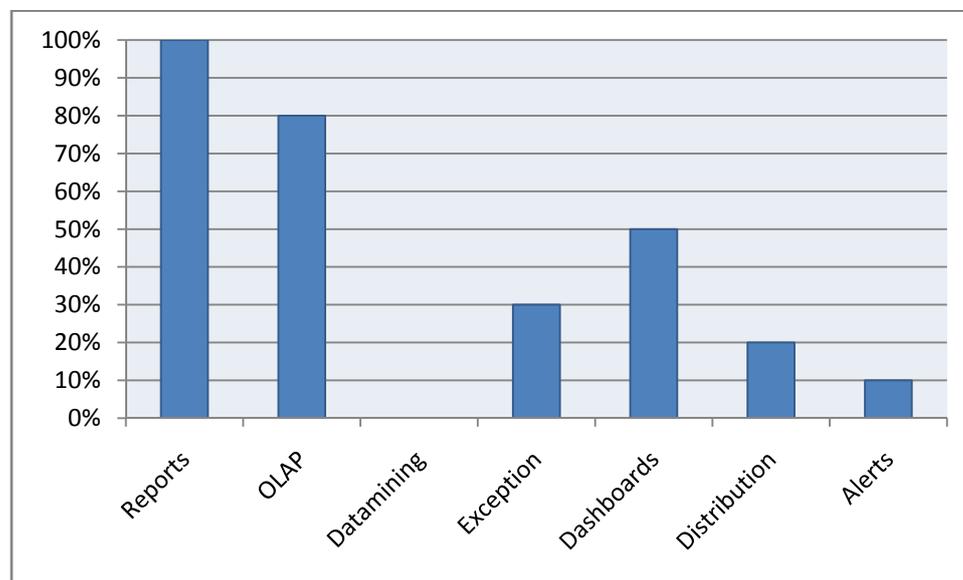


Figure 17: Results of used Business Intelligence features

It is remarkable that all organisations use BI for standard reporting. For ad hoc questions a lot of the organisations use OLAP. None of the organisations uses BI for data mining. Some interviewees said their organisations have done some tests towards data mining, but that the results where not very promising. They also think data mining is too costly. Half of the organisations use dashboards for presenting information. Exception reporting, automatic distribution and alerts are not used that much. Most interviewees said that they would like to use it in the future. Thus hypothesis H4: Business Intelligence is mainly used for reports and analyses is tested to be true.

#### 7.4.6. Total usage level

The above paragraphs all describe individual constructs for measuring the usage of Business Intelligence. In order to make it possible to link the usage to other constructs, the total usage level of Business Intelligence has to be determined. This is done by adding all individual scores. So, the maximum of the constructs of the usage level is then:  $8+6+8+2+7=31$ . In Table 8 the total Business Intelligence usage level of all organisations is presented.

**Table 8: Total Business Intelligence usage level**

Organisation	Total usage level
1	23
2	13
3	23
4	18
5	12
6	3
7	15
8	14
9	11
10	8

## 7.5. Conclusion

Almost all organisations use Business Intelligence. Half of them is still at the coordinated level of BI maturity. The Business Intelligence Maturity Matrix is valid and there is a correlation between the three dimensions.

There is a lot of difference between the maturity and use of Business Intelligence at the various organisations. It is interesting to look if these differences can be combined. This is done in the next chapter.

**“Great things are not done by impulse, but by  
a series of small things brought together.”**

*Vincent van Gogh (1853-1890)*

## 8. Relationships between results

In the previous chapter the results of the individual constructs and the explanation of them is presented. In this paragraph the constructs are combined in order to see if there are interesting relationships between the results of the various constructs.

### 8.1. Correlation between Maturity and Usage

After studying the maturity level and usage level of BI, it is interesting to look at the combination of both. Therefore the total of the maturity levels of the three Business Intelligence from Table 2 is used. Also the total of the constructs of the usage levels as described in Paragraph 7.4.6 is used. In Table 9 the results of this combination between maturity and usage of Business Intelligence is presented.

**Table 9: Total maturity and usage of Business Intelligence**

Organisation	Total maturity	Total usage
1	22	23
2	12	13
3	14	23
4	15	18
5	12	12
6	6	3
7	9	15
8	16	14
9	11	11
10	10	8

In Figure 18 the results of the combination of the maturity and usage level is shown graphically. Also a linear line which covers all points is given. The equation of this line can be found at the right side of the figure.

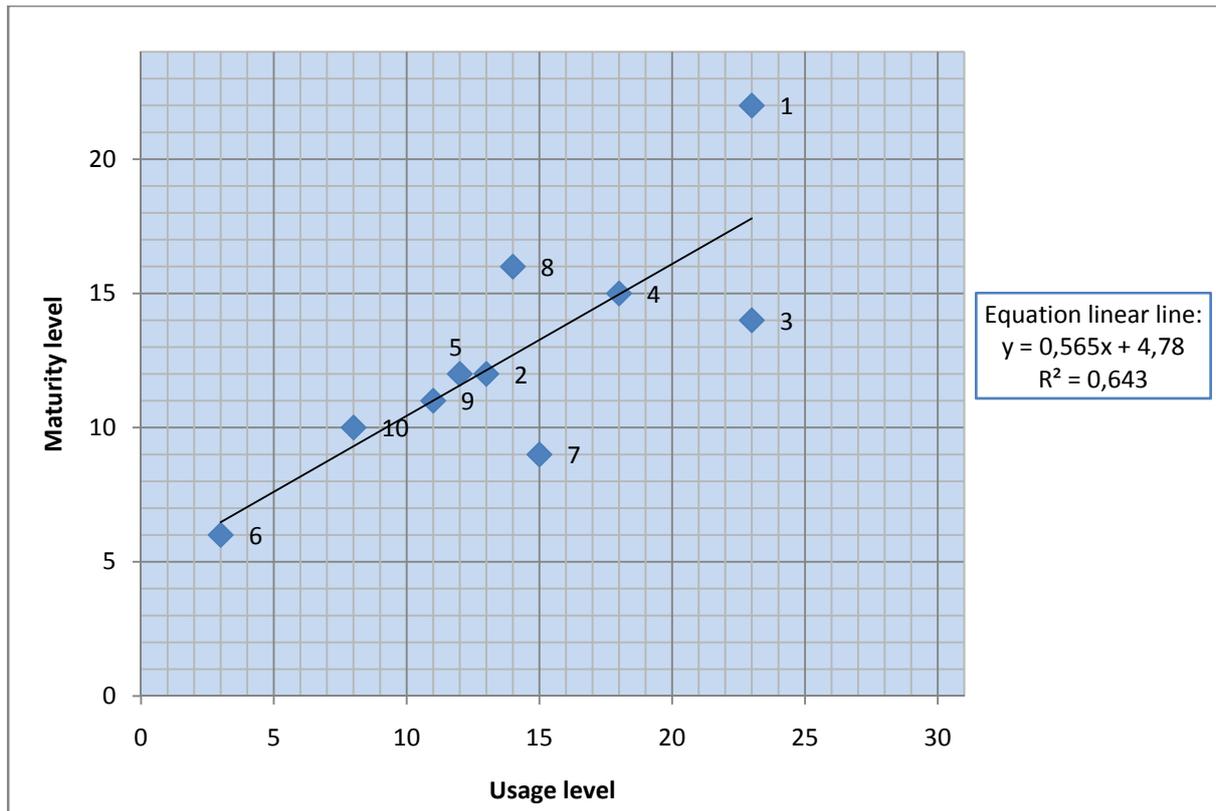


Figure 18: Maturity level vs. usage level

A possible correlation between both dimensions is tested with a Pearson Correlation test in the SPSS software. The result is a Pearson Correlation of 0.802 with a significance of 0.01. This indicates that there is a correlation between both dimensions.

Some organisations have a higher usage level in comparison with the expected usage level at their maturity level. It is their main goal to invest in BI-architecture and BI-organisation. Most of the time the ambition level is at the right level. Possible investments in BI-architecture and BI-organisations can be derived from the measures that are used to determine the constructs. These measures come from Figure 5 in Chapter 3. For the BI-architecture these are:

- Defining shared metadata
- Investing in data cleansing
- Consolidate data warehouses to one enterprise data warehouse
- Offer BI as a service
- Make more complex analysis available

For BI-organisation these are:

- Set up of a BI competence centre or service centre
- Anchor the responsibility for BI in the top of the organisation
- Make procedures for reuse and quality assurance

- Make BI full part of the business management and operations

The other organisations have a higher maturity level in comparison with the expected maturity level at their usage level. These organisations have to invest in stimulating the use of Business Intelligence, otherwise they do not use the full potential of their Business Intelligence. This would be a waste of money. There are several ways to stimulate usage. These ways can be derived from the usage constructors that are used, namely:

- *Stimulating a more extensive usage*  
This means that users get training, support and possibilities to use BI not only for fixed reports, but also for interactive reports and (complex) analysis.
- *Stimulating usage at more steering levels*  
In most organisations the use of BI starts at the strategic level. When an organisation makes it also available for the tactical and operational levels, the usage will grow. This availability means also that users have to get training and support.
- *Stimulating usage in all processes*  
Not all organisations use BI in all processes. Most of them use it in the primary processes and the supportive process 'organisation'. When organisations stimulate employees from other processes in which BI is not yet used, the usage level will grow. Of course the data of that process (and other processes) has to be available. The potential users have to get access to the system and also need training and support.
- *Stimulating an integral usage*  
An organisation can further raise the usage level by stimulating an integral usage of the BI system. This can only be realised when the data of the different processes is available in all processes. When this data is available in the BI system, analysis can be made over (a part of) the chain. It is necessary to train and support users otherwise they will not use it.
- *Stimulating the use of other Business Intelligence features.*  
When all feature of Business Intelligence are used, the users will see the advantage of Business Intelligence more and more. New questions can be answered and new information comes into existence.

Of course the method for stimulating the use of BI depends on the maturity level at which an organisation operates. If an organisation for example operates on the local level of BI, it is not fruitful to stimulate a more integral use of BI.

## 8.2. Correlation between Maturity/Usage and Classification

In order to look if there is a relationship between the maturity and the usage of food and fashion retail, the average of both is calculated. The smallest fashion organisation (6) is not counted in this average, because this would lead to misleading results. The results are presented in Table 10. The levels of both maturity and usage are higher in Food organisations. These results are as expected in hypothesis H1: Business Intelligence is more used in Groceries than in Fashion stores. But for the significance of this conclusion a T-test is done in SPSS. This results in a t-value of 2.065 with a two tailed significance

of 0.078 for the maturity level and a t-value of 0.635 with a two tailed significance of 0.545 for the usage level. The significances of both are above the normal value of 0.05. This means the difference of usage and maturity between Food and Fashion retail is not significant and H1 is tested to be false.

**Table 10: Maturity and usage in food vs. fashion**

Organisation type	Organisations	Average Maturity level	Average Usage level
<b>Food</b>	1,4,8 & 9	16	16.5
<b>Fashion</b>	2,3,5,7 & 10	11.4	14.2

The same can be done in the Big Middle segmentation. If the usage and maturity of the organisations that are in the Big Middle segment are compared with the organisations in the innovative segment also some difference should come into light. In this calculation organisation 6 is counted, because this organisation is a typical example of innovative organisation. The results are presented in Table 11.

**Table 11: Maturity and usage in Big Middle vs. Innovative**

Organisation type	Organisations	Average Maturity level	Average Usage level
<b>Big Middle</b>	1,4,5,7,8 & 9	14.17	15.5
<b>Innovative</b>	2,3,6 & 10	10.5	11.75

It is interesting to see that BI is more used in the Big Middle segment as indicated in H2: Business Intelligence is more used in organisations in the Big Middle than in innovative organisations. But for the significance of this conclusion a T-test is done in SPSS. This results in a t-value of 0.222 with a two tailed significance of 0.383 for the maturity level and a t-value of 0.524 with a two tailed significance of 0.214 for the usage level. The significances of both are above the normal value of 0.05. This means the difference of usage and maturity between Food and Fashion retail is not significant and H2 is tested to be false.

### 8.3. Combining Maturity/Usage and Trends

After combining the results of the research with the current situation in the previous paragraphs, this paragraph combines the results with the future trends in the Retail sector as presented in Chapter 5.

#### 8.3.1. Ongoing innovation

The ongoing need for innovation requires Business Intelligence which monitors the possibilities for innovation. Ways for finding such possibilities are the use of OLAP or data mining. Eighty percent of the organisations use OLAP for ad hoc questions. This does not mean necessary mean that they use it for innovative purposes. It is very reasonable that they only use it for answering more complex reporting questions. From the interviews can be determined that data mining is not used in any organisation anymore. Some interviewees said that their organisation has done test with data mining, but the results where not very promising. The organisations think it is too costly and will have a negative Return on Investment.

It is however necessary for organisations to invest in searching for possible innovations. It does not matter if they do it with OLAP or by data mining, as long as they do it. The only difference between the two is that data mining automatically finds relations and OLAP needs a person who searches for relations.

### ***8.3.2. Value chain integration***

The value chain integration goes over the organisational boundaries. It is not enough anymore to only control the internal value chain. The whole value chain from suppliers to customers has to be controlled. Therefore information about this whole chain is needed. Enterprise wide Business Intelligence is not enough anymore, the Business Intelligence system has to be chain wide.

If this trend is compared to the maturity and use of Business Intelligence at this moment, there is a large gap. Only two of the organisations (1 & 4) have integrated their own processes in the Business Intelligence system. A few organisations (3 out of 10) are loading some external data into the data warehouse. In order to realise chain wide Business Intelligence, it is essential to firstly ensure that the internal processes are integrated. Organisations which are still at the local or coordinated level of Business Intelligence Maturity have to ensure that they come at least at the integral level in order to stay in business. At the end they have to be at the intelligent level in order to be ready for chain integration with suppliers, partners and customers.

Of course it is not enough when the maturity is at the right level. Also the use of Business Intelligence has to increase. Otherwise the chain integration does not have any value. Seven of the ten organisations have their usage level below half of the maximum level. These organisations have to invest in the usage level. In the first paragraph of this chapter several ways for realising this are presented.

A problem that arises in the in the information exchange between organisations is that not all organisations want to share their information. The relation between suppliers and retailers is very fragile. When retailers know everything about the suppliers, they also can see when for example the purchase price is too high. Retailers can use this information at the yearly meetings about terms of delivery.

Therefore it is essential that a relationship based on mutual trust between retailer and supplier will be established. Beside of that it requires that retailers and suppliers are on the right level of maturity and usage. Most retailers are not yet so far. Both the maturity and usage have to be increased in order to realise this change.

A technical way to realise this integration is for example the use of web services. In the further research section of the next chapter this possibility will be further discussed.

### ***8.3.3. Increasing complexity***

Due to the grow of the organisations, their data will be more complex in the future. Therefore adequate Business Intelligence is needed. It is necessary to have all information about the organisation, or about the whole chain as discussed at the previous section, integrated into one Business Intelligence system. Eight of the ten organisations do not have their Business Intelligence fully integrated. If they want to use their Business Intelligence in the more complex future environment, they should rapidly invest in an integral solution.

The reasoning in the three paragraphs above causes hypothesis H6: Trends in retail will cause a more heavy use of the BI system to be true.

## 8.4. Conclusion

There is a correlation between the Business Intelligence maturity and the Business Intelligence use. In some organisations the Business Intelligence maturity is relatively higher than their Business Intelligence use. These organisations have to invest in stimulating the usage of Business Intelligence. Other organisations have the opposite, they have to invest in a higher Business Intelligence maturity level.

It cannot be proved that Business Intelligence is significantly more used in Food organisations than in Fashion organisations. Also the prove that Big Middle segment makes more use of Business Intelligence in comparison to Innovative organisations is not significant.

There is a strong relation between the trends in the Retail sector and the usage and maturity of Business Intelligence. The trends ongoing innovation and increasing complexity both require a good information supply. Organisations have to follow these trends and an organisation wide Business Intelligence solution is necessary. The trend value chain integration requires more than an organisation wide Business Intelligence solution. This trend requires a chain wide Business Intelligence solution. This means that suppliers, partners and customers also have to be part of the Business Intelligence system. Therefore a relationship with mutual trust has to be established between all parties. Also all involved organisations have to be at the right level of maturity and usage. If these two conditions are met the organisation is ready to integrate their BI-system with the whole chain. Then both, suppliers and retailers, will reduce cost and increase profit.

**“As a general rule the most successful man in  
life is the man who has the best information.”**

*Benjamin Disraeli (1804 - 1881)*

## **9. Conclusions**

In this final Chapter the conclusions of this research are drawn. As a guide for the research the introduction presented a main research question. In this chapter that question is answered. The main research question is:

*How is Business Intelligence used in the Dutch retail sector and how will it be used in the future?*

This research question was divided in several sub questions which are answered in the various chapters.

### **9.1. Conclusions**

There are four major conclusions from this research that answer the main research question. They are successively given in the following.

*Almost all Dutch Retail organisations use Business Intelligence*

From the empirical research which was carried out in ten Dutch retail organisations can be concluded that almost all Dutch retail organisations use Business Intelligence. Nine of the ten organisations use Business Intelligence. The one that does not use Business Intelligence at this moment is a smaller retail organisation. This organisation has started with the implementation of Business Intelligence this year.

*In most Dutch Retail organisations Business Intelligence is not used integral*

As discussed in Chapter 5 the added value in a retail organisation is in the integration of processes of the value chain. In order to make effective steering decisions, it is important that Business Intelligence is also used integral. Eight out of the ten researched organisations do not or partly use Business Intelligence integral.

*Business Intelligence is not significantly more used in Food retail than Fashion retail*

From the research can be concluded that as well as the Business Intelligence maturity as the use of Business Intelligence are on a higher level in Food retail organisations than in Fashion organisations. But these results are not significant, thus the use and maturity of Business Intelligence in both sectors are equivalent.

*Trends in retail require chain wide Business Intelligence*

The trends that are described in retail literature show that retailers will control the value chain in the future (see Paragraph 5.3). Therefore they also need information about the whole, interorganisational, value chain. Integration of Business Intelligence with suppliers, partners and customers has to be established. It is not enough anymore to integrate the internal processes.

*The Business Intelligence maturity of Dutch retail organisations is not sufficient to follow the retail trends*

The maturity of six out of ten of the researched organisations is at the coordinated level or lower. This means there is some consolidation of the several Business Intelligence solutions in these organisations. In order to follow the trends a chain wide integration of Business Intelligence is needed. Integration not only of internal processes, but also with suppliers, partners and customers. Therefore organisations have to be at the intelligent level of Business Intelligence maturity. Organisation that stay at the local or coordinated level of Business Intelligence maturity will lose their competitive advantage.

## 9.2. Recommendations

Now the conclusions of the research are drawn, recommendations for Dutch retail organisations are presented. In Paragraph 8.1 already some specific recommendations for organisations with a low usage level or a low maturity level of Business Intelligence were given. This paragraph gives more general recommendations.

*See Business Intelligence as competitive advantage*

At the end the one with the best information will be the most competitive. Therefore it is important that Business Intelligence is spread through the whole organisation. Everyone has to know the relevance of Business Intelligence. Only then the organization will have the most advantage of Business Intelligence.

*Invest in chain wide Business Intelligence*

It is necessary to invest in chain wide Business Intelligence in order to fulfill the future trends in the retail sector. This does not only mean that the Business Intelligence maturity and usage level have to increase. Also the relationships with suppliers and other partners have to be changed. It is important to establish a relationship of mutual trust. Such a relationships enables information exchange through chain wide Business Intelligence. Then both parties will benefit through reduction of cost and increasing sales.

*Invest in stimulating usage*

A lot of the organizations use not all features of Business Intelligence. It is not enough to make sure all technical parts are installed. This is only the start. When the end users are stimulate to use Business Intelligence, they will be more enthusiastic about it. Features like automatic distribution or exception reporting can lead to cost reductions.

### 9.3. Further research

Of course not every possible question in the field of Business Intelligence in the Retail sector is answered in this Master Thesis. Therefore some areas for further research are mentioned below.

One important subject for further research is the technical part of chain wide Business Intelligence. How is it possible to get the right information in time from suppliers and other partners? One possible way is the set up of a Service Oriented Architecture (SOA) with web services. It is interesting to know how this can be established. Also possible problems have to be discovered.

Also the more social part of chain wide Business Intelligence is an interesting area for further research. One could for example look at how the relation between the supplier and retailer has to involve in order to be ready for chain wide Business Intelligence.

It is also possible to carry out the same research in the United States or Asia and compare the results with the ones in this Thesis. Maybe some interesting differences will occur. This comparison can also be made with other knowledge intensive sectors in the Netherlands, for example the utilities sector.

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## Appendix A: Interview questions BI-manager

### *Algemeen*

Kunt u wat meer vertellen over uw organisatie?

Wat is uw functie binnen de organisatie?

### *Organisatorisch*

Wat verstaat u onder business Intelligence?

Wat is uw visie op Business Intelligence?

Welke business drivers waren aanleiding voor het gebruik van Business Intelligence?

Hoe zag de initiële business case eruit?

Heeft het BI systeem dit waargemaakt?

Welk voordeel heeft business Intelligence voor uw organisatie?

Wordt dit voordeel gekwantificeerd?

Wat is de Business Intelligence ambitie van uw organisatie? (understand, improve, integral of intelligent)

Wat wordt gedaan om deze ambitie te realiseren?

Is er een aparte strategie voor Business Intelligence?

Zo ja, hoe ziet die eruit en hoe is die gerelateerd aan de corporate strategie?

Zo nee, wat is er in de corporate strategie opgenomen over BI?

Hoe is BI georganiseerd in uw organisatie?

Wat zijn op dit moment de belangrijkste speerpunten van het BI-beleid? (bijv. TCO, processing time, changing user demands, changing systems)

Wat zijn de grootste uitdagingen waar u voor staat met betrekking tot BI?

Wat is het verschil tussen de initiële business case en het huidige gebruik?

### *Technisch*

Hoe ziet de architectuur van BI binnen uw organisatie eruit?

Welke systemen worden gebruikt?

Waarom is er gekozen voor deze systemen?

Voldoen deze systemen aan de verwachtingen?

Zijn deze systemen geïntegreerd?

In hoeverre zijn er zaken gestandaardiseerd? (tooling, infrastructure, metadata, implementation, training)

Hoe wordt de kwaliteit van data bewaakt?

Welk soort analyses/rapportages worden op dit moment gebruikt?

Welk soort analyses/rapportages zou u nog graag willen toevoegen?

Wat is de verhouding tussen statische en dynamische rapportages?

Welke procesonderdelen zijn er nu nog niet ondersteund met BI? Waarom niet?

Worden naast interne bronnen ook externe bronnen gebruikt? Zo ja, welke?

Wordt er gebruik gemaakt van datamining?

### *Projecten*

Hoe komen BI-projecten tot stand?

Wordt BI gepusht of gepulled in uw organisatie?

Hoe zijn BI-projecten georganiseerd?

Hoe zijn projectteams samengesteld?

In hoeverre wordt er bij nieuwe projecten gebruik gemaakt van eerdere projecten?  
In hoeverre zijn projecten gebaseerd op de BI-strategie?

#### *Gebruik*

Welke afdelingen/business units maken gebruik van BI en welke nog niet?  
Welke processen worden met BI ondersteund? (Inkoop, Marketing, Merchandising, inkomende/uitgaande logistiek, Sales, HRM, vastgoed, IT)  
In hoeverre wordt BI gebruikt in de integratie van deze processen?  
Wordt uw BI systeem ook buiten uw organisatie gebruikt?  
Wordt er gebruik gemaakt van Exception Reporting?

#### *Quantitatief*

Wanneer is het eerste BI-project gestart?  
Hoe lang heeft de initiële invoering geduurd van uw BI systeem?  
Wat is bij de start het jaarlijkse budget voor BI?  
Wat is het huidige jaarlijkse budget voor BI?  
Hoeveel data wordt bevindt zich in het datawarehouse?  
Hoeveel gebruikers zijn er voor BI?

## Appendix B: Interview questions BI-employee

### *Algemeen*

Kunt u wat meer vertellen over uw organisatie?

Wat is uw functie binnen de organisatie?

### *Organisatorisch*

Wat verstaat u onder business Intelligence?

Wat is uw visie op Business Intelligence?

Welke business drivers waren aanleiding voor het gebruik van Business Intelligence?

Hoe zag de initiële business case eruit?

Heeft het BI systeem dit waargemaakt?

Welk voordeel heeft business Intelligence voor uw organisatie?

Wordt dit voordeel gekwantificeerd?

Wat is de Business Intelligence ambitie van uw organisatie? (understand, improve, integral of intelligent)

Wat wordt gedaan om deze ambitie te realiseren?

Is er een aparte strategie voor Business Intelligence?

Zo ja, hoe ziet die eruit en hoe is die gerelateerd aan de corporate strategie?

Zo nee, wat is er in de corporate strategie opgenomen over BI?

Hoe is BI georganiseerd in uw organisatie?

Wat zijn op dit moment de belangrijkste speerpunten van het BI-beleid? (bijv. TCO, processing time, changing user demands, changing systems)

Wat zijn de grootste uitdagingen waar u voor staat met betrekking tot BI?

Wat is het verschil tussen de initiële business case en het huidige gebruik?

### *Technisch*

Hoe ziet de architectuur van BI binnen uw organisatie eruit?

Welke systemen worden gebruikt?

Waarom is er gekozen voor deze systemen?

Voldoen deze systemen aan de verwachtingen?

Zijn deze systemen geïntegreerd?

In hoeverre zijn er zaken gestandaardiseerd? (tooling, infrastructure, metadata, implementation, training)

Hoe wordt de kwaliteit van data bewaakt?

Welk soort analyses/rapportages worden op dit moment gebruikt?

Welk soort analyses/rapportages zou u nog graag willen toevoegen?

Wat is de verhouding tussen statische en dynamische rapportages?

Welke procesonderdelen zijn er nu nog niet ondersteund met BI? Waarom niet?

Worden naast interne bronnen ook externe bronnen gebruikt? Zo ja, welke?

Wordt er gebruik gemaakt van datamining?

### *Projecten*

Hoe komen BI-projecten tot stand?

Wordt BI gepusht of gepulled in uw organisatie?

Hoe zijn BI-projecten georganiseerd?

Hoe zijn projectteams samengesteld?

In hoeverre wordt er bij nieuwe projecten gebruik gemaakt van eerdere projecten?  
In hoeverre zijn projecten gebaseerd op de BI-strategie?

#### *Gebruik*

Welke afdelingen/business units maken gebruik van BI en welke nog niet?  
Welke processen worden met BI ondersteund? (Inkoop, Marketing, Merchandising, inkomende/uitgaande logistiek, Sales, HRM, vastgoed, IT)  
In hoeverre wordt BI gebruikt in de integratie van deze processen?  
Wordt uw BI systeem ook buiten uw organisatie gebruikt?  
Wordt er gebruik gemaakt van Exception Reporting?

#### *Quantitatief*

Wanneer is het eerste BI-project gestart?  
Hoe lang heeft de initiële invoering geduurd van uw BI systeem?  
Wat is bij de start het jaarlijkse budget voor BI?  
Wat is het huidige jaarlijkse budget voor BI?  
Hoeveel data wordt bevindt zich in het datawarehouse?  
Hoeveel gebruikers zijn er voor BI?

## Appendix C: Interview questions end user

### *Algemeen*

Kunt u wat meer vertellen over uw organisatie?

Wat is uw functie binnen de organisatie?

### *Organisatorisch*

Hoe kijkt u aan tegen informatie?

Wat verstaat u onder business Intelligence?

Wat is uw visie op Business Intelligence?

Welk voordeel heeft business Intelligence voor uw organisatie?

Wordt dit voordeel gekwantificeerd?

Is het gebruik van informatie opgenomen in de bedrijfsstrategie en de afdelingsstrategie?

In hoeverre is informatie nodig in uw dagelijkse arbeid?

Hoe is BI georganiseerd in uw organisatie?

Hebt u het gevoel dat er een information overload is in uw afdeling?

Hebt u altijd inzicht in de juiste informatie?

Wat zijn de grootste uitdagingen waar u voor staat met betrekking tot BI?

Hoe wordt de kwaliteit van data bewaakt?

### *Gebruik*

Welke systemen gebruikt u hiervoor?

Hoe zou u functioneren zonder de juiste informatie via het BI-systeem?

Hoe reageert u wanneer het systeem een dag plat ligt?

Wordt de informatie in deze systemen op een goede manier aangeboden?

Welke rapportages en analyses gebruikt u op dit moment?

Welke rapportages en analyses zou u nog graag kunnen opvragen?

Waar kunt u terecht met vragen met betrekking tot rapportages?

Hoe worden rapportages aangeboden?

Gebruikt u alleen statische rapporten of maakt u ook gebruik van OLAP?

Welke data wordt gebruikt om de rapportages te maken?

Heeft u belang bij informatie van andere afdelingen?

In hoeverre is de beschikbare informatie vanuit diverse afdelingen geïntegreerd en beschikbaar?

Worden naast interne bronnen ook externe bronnen gebruikt? Zo ja, welke?

Wordt er gebruik gemaakt van datamining?

Welke afdelingen/business units maken gebruik van BI en welke nog niet?

Welke processen worden met BI ondersteund? (Inkoop, Marketing, Merchandising, inkomende/uitgaande logistiek, Sales, HRM, vastgoed, IT)

In hoeverre wordt BI gebruikt in de integratie van deze processen?

Wordt uw BI systeem ook buiten uw organisatie gebruikt?

Wordt er gebruik gemaakt van Exception Reporting?

### *Projecten*

Wat is de procedure wanneer u een toevoeging/wijziging aan uw rapportages/analyses wilt?

Hoe komen BI-projecten tot stand?

Wordt BI gepusht of gepulled in uw organisatie?

Hoe zijn BI-projecten georganiseerd?

Hoe zijn projectteams samengesteld?

In hoeverre wordt er bij nieuwe projecten gebruik gemaakt van eerdere projecten?

In hoeverre zijn projecten gebaseerd op de BI-strategie?

*Quantitatief*

Hoeveel rapporten vraagt u per week op?

Hoeveel van deze rapporten gebruikt u daadwerkelijk?

Hoeveel analyses voert u uit of laat u uitvoeren?

## Appendix D: explanation classification BIMM

In this appendix the classification of the organisations in the Business Intelligence Maturity Model is explained. Successively the ambition level, the organisation level and the architecture level are discussed.

### Ambition level

Organisation	Level	Explanation
1	Fully intelligent	<ul style="list-style-type: none"> <li>The BI-manager said that BI is also available for customers and suppliers. The BI-employee underpins this.</li> <li>Beside of that organisation 1 can be defined as intelligent organisation because the BI-manager defines BI as a corporate asset. From the interviews with the BI-employee and end users this major role for information in general and particularly BI is also underpinned.</li> <li>The BI-manager has described some usage of BI from which can be concluded that the ambition is to 'innovate'.</li> </ul>
2	Partly integral	<ul style="list-style-type: none"> <li>The ambition of the BI-manager is to have an integral solution for BI.</li> <li>On the coordinated level they have some consolidation and BI is especially used for steering.</li> <li>From the interviews does not come true that they use information pro-actively.</li> </ul>
3	Partly integral	<ul style="list-style-type: none"> <li>The BI-manager says that the major advantage of BI is the possibility of timely steering.</li> <li>There is one system with operational data, this is automatically loaded into the data warehouse and thus consolidated.</li> <li>The end user of organisation says that he sometimes use information pro-actively.</li> </ul>
4	Partly integral	<ul style="list-style-type: none"> <li>The BI-manager, the BI-employee and one of the end users say all that there is an integral view of the organisation.</li> <li>At this moment the information is not used pro-actively.</li> </ul>
5	Partly integral	<ul style="list-style-type: none"> <li>As the BI-manager says one of the business drivers of the start with BI is to have performance reports over all processes. So an integral view of the organisation.</li> <li>The ambition is not yet on the pro-active use of information.</li> </ul>
6	Fully coordinated	<ul style="list-style-type: none"> <li>As the director says, organisation 6 does not have a BI-system. Reports are generated from operational</li> </ul>

Organisation	Level	Explanation
		systems. It is used at department level, just for explanation afterwards. This year the organisation starts with the implementation of a BI system. The ambition is to consolidate the various systems into one BI system and will be used for timely steering.
7	Fully coordinated	<ul style="list-style-type: none"> <li>The IT-manager says that he wants an integral view of the organisation. But the organisation is not yet ready for it. Therefore he focuses at this moment on limited consolidation. At this moment the information is most of the time used for explanation afterwards, but the ambition is to steer timely.</li> </ul>
8	Fully integral	<ul style="list-style-type: none"> <li>The information manager states that at this moment a lot of the operational systems are loaded into the data warehouse. The ambition is to load all data in the data warehouse in order to have an integral view.</li> <li>The end users state that they use the BI system to make complex analysis with which the information can be used pro-actively</li> </ul>
9	Fully integral	<ul style="list-style-type: none"> <li>At this moment organisation 9 starts with the implementation of an enterprise data warehouse. The information manager states that the ambition is to better act on a local level and to support the business pro-actively.</li> </ul>
10	Fully coordinated	<ul style="list-style-type: none"> <li>The data is consolidated in one data warehouse. There is no ambition to use it in an integral way.</li> <li>The data is mainly used for timely steering. As a user states: it is important to use BI to look in the future. On basis of that the processes can be steered.</li> </ul>

### Organisation level

Organisation	Level	Explanation
1	Partly intelligent	<ul style="list-style-type: none"> <li>The BI-manager said that BI is a corporate asset. Beside of that he is corporate BI manager and reports directly to the board. Therefore BI = Board Issue.</li> <li>The BI-manager states that in all departments BI is used with a vision. Therefore BI is full part of the business management and operations.</li> <li>Although all interviewees have declared that there is a BI competence centre, there is not yet one Shared Service Centre.</li> </ul>
2	Fully coordinated	<ul style="list-style-type: none"> <li>The IT-manager states there is a shared project bureau with a steering group which plans the</li> </ul>

Organisation	Level	Explanation
		<p>projects: program management.</p> <ul style="list-style-type: none"> <li>• The IT-manager is a IT manager and he steers BI.</li> <li>• Via external workers the professionalism is growing.</li> </ul>
3	Fully coordinated	<ul style="list-style-type: none"> <li>• There is a shared project bureau as the IT-manager states.</li> <li>• The IT-manager steers BI, although the rest of IT is outsourced.</li> <li>• There is program management, as the IT-manager says.</li> <li>• Employees are trained so there is growing professionalism.</li> </ul>
4	Fully coordinated	<ul style="list-style-type: none"> <li>• The IT-alignment manager states he steers BI.</li> <li>• The IT-alignment manager as well as the BI employee say that there is a shared project bureau. Program management is done by IT-alignment manager.</li> <li>• Professionalism is growing through external employees.</li> </ul>
5	Fully coordinated	<ul style="list-style-type: none"> <li>• The IT-manager says there is a shared project bureau.</li> <li>• Projects are part of a generic model, so there is program management.</li> <li>• There is growing professionalism through training and external employees.</li> <li>• The IT-manager steers BI.</li> </ul>
6	Partly local	<ul style="list-style-type: none"> <li>• The manager says there is only some ad hoc development and management.</li> </ul>
7	Partly coordinated	<ul style="list-style-type: none"> <li>• There is not yet a shared project bureau for BI.</li> <li>• There is not yet program management, BI is set up on ad hoc basis.</li> <li>• Steering is done by IT-management</li> <li>• Professionalism is expected from external parties.</li> </ul>
8	Partly integral	<ul style="list-style-type: none"> <li>• IT-manager: There is a corporate BI Competence Centre, although every business unit has its own BI-employees.</li> <li>• IT-manager: Fees have to be paid for the BI services that the holding delivers to the business unit.</li> <li>• Steering is not done by the CIO.</li> <li>• There is some reuse.</li> </ul>
9	Partly coordinated	<ul style="list-style-type: none"> <li>• There is no shared project bureau for BI.</li> <li>• Program management is not in use.</li> <li>• Steering is done by the IT managers</li> <li>• There is growing professionalism through external workers and training.</li> </ul>
10	Partly	<ul style="list-style-type: none"> <li>• There is no shared project bureau for BI.</li> </ul>

Organisation	Level	Explanation
	coordinated	<ul style="list-style-type: none"> <li>• Program management is not in use.</li> <li>• Steering is done by the IT managers</li> <li>• There is growing professionalism through external workers and training.</li> </ul>

### Architecture level

Organisation	Level	Explanation
1	Partly intelligent	<ul style="list-style-type: none"> <li>• There is an enterprise data warehouse in which all information of the organisation is integrated.</li> <li>• There is continuous improvement of processes.</li> <li>• BI is not yet delivered as a service.</li> <li>• They are experimenting with a real time closed loop.</li> <li>• By the definition of integral metadata and several data quality checks, the total data quality management is ensured.</li> </ul>
2	Partly coordinated	<ul style="list-style-type: none"> <li>• This organization has a production part as well as a retail part. The data warehouse of the retail part is consolidated.</li> <li>• Inside the retail part there is also tool standardisation, although the rest of the organisation uses a different tool.</li> <li>• Portals or dashboards are not used.</li> <li>• In retail metadata is exchanged.</li> <li>• Also interactive analyses are used.</li> <li>• Because only a part of the total organisation is standardised this organisation is partly at the coordinated level.</li> </ul>
3	Partly integral	<ul style="list-style-type: none"> <li>• There is consolidation of data warehouses.</li> <li>• Tools are not standardised because than for each BI-feature one gets 80 percent in stead of 100% functionality.</li> <li>• Dashboards are used.</li> <li>• Metadata is shared.</li> <li>• Interactive (OLAP) analyses are possible.</li> <li>• Data is cleaned through the operational systems. Almost 1 system for the whole organisation.</li> <li>• Although the tools are not standardised, this organisation is partly at the integral level.</li> </ul>
4	Fully integral	<ul style="list-style-type: none"> <li>• There are shared data marts.</li> <li>• Methods for implementation are standardised.</li> <li>• There are methods for data cleaning.</li> <li>• Shared metadata is defined.</li> </ul>
5	Partly coordinated	<ul style="list-style-type: none"> <li>• There is some consolidation of data warehouses.</li> <li>• There is standardisation of tooling.</li> <li>• BI portals are not used.</li> </ul>

Organisation	Level	Explanation
		<ul style="list-style-type: none"> <li>• Metadata is defined.</li> <li>• There are interactive analyses.</li> </ul>
6	Partly local	<ul style="list-style-type: none"> <li>• There are no data marts, analyses are done over operational systems.</li> <li>• There are many different tools.</li> <li>• There are no standards.</li> <li>• Data quality is not assured.</li> <li>• Data is mostly used for reports.</li> </ul>
7	Fully local	<ul style="list-style-type: none"> <li>• For different systems there are different data marts</li> <li>• There are several different tools.</li> <li>• There is no standard for BI.</li> <li>• Data quality is a little bit assured through checks on totals.</li> <li>• Only reports and a few analyses are used.</li> </ul>
8	Partly integral	<ul style="list-style-type: none"> <li>• Shared data marts are used in different departments.</li> <li>• Methods are not yet standardised.</li> <li>• Data is not cleaned, only checks on totals are carried out.</li> <li>• There is shared metadata.</li> <li>• Complex analyses are done in for example the marketing department.</li> </ul>
9	Fully local	<ul style="list-style-type: none"> <li>• Each department uses a different tool and different data marts.</li> <li>• There are no standards.</li> <li>• Data quality is not assured very well.</li> <li>• Only reports are built. Sometimes a few analyses are done.</li> </ul>
10	Partly coordinated	<ul style="list-style-type: none"> <li>• Data warehouses are consolidated.</li> <li>• One tool is used.</li> <li>• Dashboards are not used.</li> <li>• Metadata is exchanged.</li> <li>• Only static reports are used. There is no interactive analysis.</li> </ul>

## Appendix E: explanation classification usage level

In this appendix the classification of the organisations in different constructors of the usage level is explained. Successively the user types and usage at steering levels are discussed.

### User types

Organisation 1 has a lot of standardised reports and reports in which some drilling is possible. This means there are a lot of farmers and tourists. They also have a lot of explorers which combine data from several sources. A few employees use BI in order to search for complex relations.

The manager of organisation 2 says there are mainly standard reports. Some employees have reports in which they can drill, another few make some interactive analysis.

Organisation 3 has different tools for the user types. All types of analyses are made, so all types of users are present.

Organisation 4 uses BI mainly for static reports. There are some users which carry out some analyses.

Organisation 5 uses BI mainly for reports. Beside of that there are a certain number of users which do some interactive analysis. Only a few users of the controlling department make more complex analysis with data from several sources.

Organisation 6 has mainly farmers, although they do not use a BI system for their reports.

Organisation 7 has several BI systems which are used mainly for reports. Some employees make more interactive analysis.

80% of the reports and analyses of organisation 8 are static. But beside of that they make use of more interactive and sometimes complex analyses.

At organisation 9 the BI systems are mainly used for reports. Beside of that some interactive analyses are done. Only the marketing department makes such analyses. Therefore this organisation has a lot of farmers and some explorers.

The manager of organisation 10 declares that they have only standardised reports. Therefore they only have farmers. It is interesting that this is an explicit decision in order to reduce the time employees are busy with the creation of reports.

### Usage at steering levels

All interviewees of organisation 1 said that BI is a major part of their organisation. It is used with a vision at all levels.

In organisation 2 BI is mainly used at the strategic level. At tactical and operational level the use is growing.

The IT-manager of organisation 3 pinpoints that BI is used at all levels in the organisation. Everyone is looking at the same Key Performance Indicators. At operational level there are also still operational systems in use to deliver reports.

At organisation 4 BI is used at all levels, although the use is not very heavy. The Information manager says the main task of the organisation in the forthcoming months is to stimulate the use.

Organisation 5 uses BI at all levels, although the use is not very heavy.

Organisation 6 does not use BI at all. At Strategic level Excel is used to make management reports.

At this moment organisation 7 only uses BI a bit at operational and tactical level. They are busy with the implementation at strategic level.

In organisation 8 BI is fully used at strategic level. Also on tactical level, BI is used very well. On operational level the use of BI could grow.

At organisation 9 BI is used at all levels, although not heavily.

Organisation 10 uses BI on all levels.