



# Information Quality Realization in Business Intelligence Systems

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# Abstract

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## Abstract:

The amount of information is increasing with vast numbers every day and organizations are therefore having more and more trouble with controlling their information flow, which limits their ability to be competitive. To solve this problem the use of Business Intelligence systems has swiftly increased recently, becoming a top investment priority. However, there seems to be a problem with people and decision-makers relying more on “gut-feeling” than the information delivered by these BI systems. Information Quality is established as a critical success factor and addresses many of the issues our problem area highlights such as believability. The research field has already developed well-established theories regarding what information quality is and also how it is related to Business Intelligence systems. However we found a lack of research and literature on how information quality is realized in Business Intelligence systems. In order to examine how one can deal with information problems and realize IQ we chose the framework of Strong et al. (1997) as a basis. This thesis then performed interviews with developers, which was combined with a survey with Business Intelligence users. The results of this showed that information quality still is quite poorly realized. It was found that especially two quality dimensions are more significantly realized than others, Access Security and Relevance in the information. 13 variables or ways of realizing information quality was also identified.

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## Introduction

The information age, the information society, the information revolution, whether or not these are examples and future references to the age we currently live in, information is something very central both in today's everyday life and business. The rate in which we create information is rapidly growing. According to [youtubereport2009.com](http://youtubereport2009.com) the 5<sup>th</sup> of March 2009 You Tube reached 100 million US viewers and Internet users had in total viewed 14.8 billion videos online. Wikipedia.org hosts 3,090,403 articles in English and has 65 million visitors monthly as of 2009 ([www.wikipedia.org/wiki/wikipedia:about](http://www.wikipedia.org/wiki/wikipedia:about)). Although statistics might prove wrong, they give a hint about how vast today's data and information creation is. This information creation is not isolated to the Internet and popular websites; think for example about how many excel sheets that can be created every day and how many sales that are conducted every day. We create a lot of information both inside and outside companies every day.

Making sense and finding ways to use this vast data and information that flows through the extended enterprise is becoming a key to success in today's business. Only the most competitive companies can sustain market success in today's fast moving and dynamic environments. And the key to this competitiveness is the capability of leveraging information about their surroundings. So to achieve this success, organizations turn towards business intelligence (BI). (Gangadharan & Swami, 2004)

The concept of BI is becoming an increasingly popular investment and the BI market has had an increasing growth during the last years. BI is one of the top priority IT investments today according to both Gartner and Merrill Lynch research (Yeoh et al., 2008). Moreover, companies like Microsoft, Hyperion, Oracle and Cognos are all working with the development and implementation of BI systems. Luftman & Kempaiah (2007) present BI as the second most important application and technology development in their article about key issues for IT executives in MIS quarterly. The benefits of BI have created a lot of attention because of its possibilities to improve the timeliness and quality of the input to the decision making process (Negash, 2004).

*"BI systems combine data gathering, data storage and knowledge management with analytical tools to present complex and competitive information to planners and decision makers"* Negash (2004, p. 178)

Although organizations are interested in information they are not interested in just any information. High quality information is crucial to BI success (Yeoh et al., 2008) and poor quality can have a severe impact on overall effectiveness of an organization (Wand & Wang, 1996). So there is an interesting and challenging environment for organizations today where it seems like it is insufficient to only collect and use vast amount of information, organizations also have to manage information in a way that it stays qualitative in order to be competitive (Yeoh et al., 2009). This puts a lot of pressure on the BI system itself and that is why we believe BI to be a very interesting field of research and especially in relation to information quality.



The term of Information quality has more than one definition, ranging from a simpler operational view defining information quality as a relationship between the true information and its representation in a system, where quality is achieved by a good balance between these two factors (Wang et al., 2008). At the other end of the spectrum there are broader definitions which extend the definition of information quality to include the information that is fit for use by data consumers (Strong et al., 1997). In our thesis we will use this broader view of information quality that also incorporates contextual dimensions such as usability and usefulness (Strong et al., 1997). The terms data quality and information quality will be used interchangeably in this study as they are viewed as equal. Further arguments to support this can be found in 2.6.1.

## **1.1 Problem area**

In spite of the trend and the increased attention to Business Intelligence systems, Hostmann (2007) argues that even if the organizations have implemented and use BI systems they seem to be unsuccessful in leveraging the information they need. Either because they lack confidence in the information, the information is hard to find or it takes too long time to find. Even the slightest indication to poor information quality often hinders managers from reaching a decision (Redman, 1998). Organizations are often unable to use the BI systems in order to make better decisions and improve their performance (Hostmann, 2007).

One of the critical success factors for BI is information quality (DeLone & McLean, 1992; Wand & Wang 1996; Wixom & Watson 2001; Yeoh et al., 2008). E.g. information quality has been rated as a top concern in data warehouse projects (Lee et al., 2001). We do not suggest that information quality is the only or the most important (neither the least important) success factor for information systems. A long range of other critical success factors have been identified in the literature, such as system quality, user satisfaction, individual impact, governance support, clear business vision and many more (Yeoh et al., 2008; DeLone & McLean, 1992; Watson, 2007). However, information is something very central in BI systems and information can only be *“fully integrated and exploited for greater business value once its quality and integrity is assured”* (Yeoh et al. 2008, p. 90). Burns (2005) highlights a Gartner research indicating that as much as 50% of all the data warehouse projects fail because information quality has been ignored.

When we read about BI and considered all the information that is created, how it is becoming an increasingly popular investment (Yeoh et al., 2008) and yet often fails to deliver what it is supposed to, we looked into how the connection between BI and information quality actually looks like in practice.

Burns (2005) and Strong et al. (1997) indicate that information quality is an important factor for BI and that IQ often was a source of failure. We could however not find as much literature about how information quality actually was realized in BI systems. We also found quite a lot of research concerning BI as well as for information quality and information quality's impact on BI. However we have not found any research aimed at describing how information quality is realized in BI systems. In order to give an answer to what should be done to such numbers as those Burns (2005) presents we must first ask ourselves how

information quality is present in BI systems before looking at how information quality is realized.

## **1.2 Problem**

The introduction and problem area present information suggesting that information quality is an important factor in BI success and that there might be parts of information quality that has received less attention and are not as realized in actual systems. There is a missing connection between information quality and its realization in BI systems that seemingly have not received enough attention in the research literature.

Thus we present the following research question:

*How is information quality realized in Business Intelligence systems?*

The *purpose* is to identify information quality's realization in BI systems.

## **1.3 Delimitations**

We focus solely on how information quality is realized in BI systems. A “How” question can be very wide and we therefore need to delimit our topic. An important delimitation of our thesis is that we do not intend to further develop any existing information quality frameworks or try to expand an existing framework. Neither do we create a critical success factor framework or investigate information quality in comparison to any other critical success factor for IS implementation presented by for example (DeLone & McLean, 1992).

In this thesis we only attempt to present the implications of information quality in our practical context which consist of the developers views of how to realize information quality and the users views of how well dimensions and certain variables and information quality have been realized.

## **1.4 Research design**

In order to approach our research question we use a multi-phase research design including both interviews and a survey. Fig 1.1 presents the general idea of our approach. The first phase consists of a literature review where we select a theoretical framework. The second phase incorporates two interviews which are the foundation to our survey questions. The survey itself is the third and final phase of our thesis where the findings from literature and interviews are tested. Thus all phases contribute to our final result.

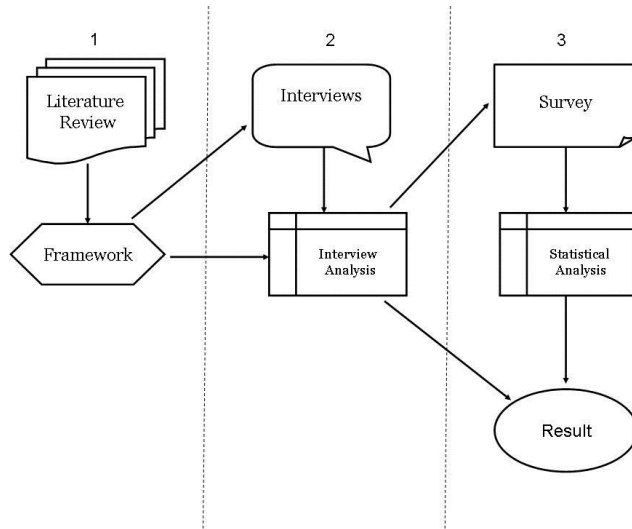


Figure 1.1 Research process

## 2. Literature review

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*This chapter will present key concept and areas based on literature. This includes descriptions of Business Intelligence, Decision Support Systems and Data Warehouse. The importance of data and information quality will be noticeable in these sections but we will further look into the role of information in BI and the relation between information quality and Business Intelligence. The chapter will also present how Information Quality is created in a sufficient way. We will then proceed by presenting different frameworks of Information Quality dimensions and also choose one to use as a foundation to our research.*

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### 2.1 Business Intelligence

According to Turban et al. (2007) Business Intelligence has different meanings for different people and is therefore a so called content-free expression. Turban et al. (2007) also state that the major objective of BI is to give business managers and analysts the tools needed to conduct analysis. This is done through interactive access to current as well as historical data, situations and performances, which all provide insight in the organisation and enables informed decisions.

Watson & Wixom (2007) present a general BI framework that includes two primary activities which in the words of the author are described as: “*getting data in*” and “*getting data out*”. The activity of getting “*data in*” is generally referred to as Data Warehousing (DW) which involves moving data from a set of source systems into an integrated DW or repository. The part of data warehouses in BI is presented further in section 2.1.3.

The part of getting “*data out*” is where the power of BI is displayed because of the use of analytical functions to present the data in useful contexts (Watson & Wixom, 2007). Besides supporting different decision situations the following list presents some examples of useful areas of applications and implementation for BI where you “*get data out*”:

- Predictive and forecast capabilities based on historical data, past and current performances etc. (Negash & Gray, 2003)
- Visualization through dashboards and other visual means of company performance (Hennen, 2009)
- Functions for scenarios and “what if” analysis (Negash & Gray, 2003)
- Competitive intelligence (CI), a systematic and ethical process to ensure your competitiveness in the market place by gathering, analyzing and managing external information to create a better understanding of your competitors (Negash & Gray, 2003).
- Geographic information systems (GIS) that links data and information to electronic maps to increase the value of information and present it in an understandable way (e.g. find new store location based on specified criteria) (Negash & Gray, 2003).

**List 2. 1 Examples of application areas for BI**

These areas can be defined as Operational BI that: *“puts reporting and analytics applications into the hand of business users who can leverage information to work more efficiently and improve results.”* Violino (2008, p.1)

Data has a central role in BI systems (Dubois, 2005). Glase & Stone (2008) further describe the central role of data by presenting a number of areas that BI consists of:

- The infrastructure: all hardware, software and networks
- Data acquisition: the source applications or systems that will feed data
- Data integration: the software for extracting cleaning and linking data
- Data aggregation and storage: the repository or data warehouse
- Data analyses: the software for querying and modelling
- The portal: or the dashboard or control pane with which end users interact

**List 2. 2 BI constructs (Glase & Stone, 2008)**

## **2.2 Decision Support Systems**

Business intelligence has emerged as a natural outgrowth of previous decision support systems (DSS) and the area of DSS is therefore closely related to Business Intelligence (Negash & Gray, 2003). Power (2007) further highlights the close connection between BI and DSS by generally describing BI as data driven DSS (as opposed to for example document driven DSS where documents are analyzed).

Decision Support Systems is also a content-free expression and can be viewed as “...an umbrella term to describe any computerized system that supports decision making in an organization” Turban et al. (2007, p. 21)

There are many similarities between DSS and BI since they are both about information retrieval but Turban et al. (2007) have outlined some of common differences. One is that DSS usually has a more direct purpose for decision making while BI has more of a support function and indirectly support decisions. BI tools are also more focused towards executives and strategists while DSS has a more analytical purpose. This perception is however according to Turban et al. (2007) somewhat changing, creating additional similarities between the two. BI also implies the use of a data warehouse while DSS may or might not use such a function. There is also a tendency that DSS methodologies and tools have been developed in the academic society while BI tools have emerged in the business world. (Turban et al., 2007)

The term DSS and its relation and differences to BI is discussed by Power (2007) who concludes that as DSS technology develops, the term DSS is growing too large and vague and one should be more precise and further define the type of DSS. Power (2007) states that many developers and vendors want to replace DSS with the term Business Intelligence. Power does however argue for the importance of historical continuity and terminology and therefore want to use the more specific term Data Driven DSS for systems created with the purpose of providing managers with intelligent information about the status, environment and operations of a business.

## **2.3 Data warehouse**

*“A physical repository where relational data are specially organized to provide enterprise-wide, cleansed data in a standardized format.”* (Turban et al., 2007, p. 754)

Data warehousing usually involves moving data from a number of source systems, transforming it and then loading it into an integrated data repository. This extract, transform and loading (ETL) process is the most challenging aspect of BI and can sometimes require about 80 percent of the time and effort of the BI project because of the complexity within information definitions and relationship between data. The purpose of this process is to match and consolidate data so that it is meaningful for decision support. (Watson & Wixom, 2007)

The process of cleansing data is also highlighted by Han & Gao (2009) who argue that the very difficult and extremely important step of consolidating or transforming the data is essentially about the data and the corporate business rules that relate the data elements to each other.

## **2.4 Relation between Information Quality and Business Intelligence**

Our introduction highlights a fundamental issue within business intelligence: information quality. Section 2.1- Business Intelligence, also presents the central role of data in BI. Data can according to Strong et al. (1997 b, p.1) be viewed as: *“information at an early stage of processing”* while information is the product at a later stage. This thesis acknowledges the importance of both data and information quality and combines the concept of data quality into the concept of information quality for reasons further described in section 2.6.1.

The focus on information quality in relation to business intelligence has been highlighted by a number of articles (Dubois, 2005; Raghunathan, 1999; Watson & Wixom, 2007; Wixom et al., 2001; Han & Gao, 2009; Yeoh et al., 2008)

*“The (BI) application’s ability to help executives make decisions ultimately depends upon the relative quality of data within the application”* (Dubois, 2005, p.1)

Information quality has been a recognized part of information system implementation since DeLone & McLean proposed it as a crucial factor for implementation in 1992. Yeoh et al. (2008, p. 90) also found that:

*“Quality of data, particularly at the source systems, is crucial if a BI system is to be implemented successfully.”*

Yeoh et al. (2008) state that corporate data can only be exploited for a greater value if the quality and integrity of the data has been assured. They also found that not enough time is spent to ensure that the information quality is maintained by data governance processes.

Raghunathan (1999) investigated the impact of information quality and decision-maker quality on decision quality to investigate whether information quality improves the actual performance of decision making. Decision-maker quality refers to the quality of the decision-making process. They came to the conclusion that:

*“In situations where exact relationships among problem variables exist, the decision quality improves with improvement in information quality for decision-makers with accurate knowledge of the relationships. However, for decision-makers that do not have sufficiently accurate knowledge of the relationships, the decision quality can decrease when information quality increases. If decision-maker quality improves simultaneously with information quality, then performance improves with information quality.”* (Ragunathan, 1999, p. 284)

Strong et al. (1997 b) presents a number of examples of information quality problems which can be useful when describing the area. There can for example be inconsistency problems where two systems are supposed to contain the same information but they don't. It can also be difficult or time consuming to use the information because there is such a large amount of information in the system. These problems affect the use of information (Strong et al., 1997 b) and as described by Raghunathan (1999) above, the information quality aspects and

the decision makers' knowledge of these aspects affect the decision maker and their decisions. The primary objective of a BI is to support sound decision making (Marshall et al., 2004).

## **2.5 Establishing Information Quality**

As stated in the section 2.1, BI relies on some kind of data warehouse to consolidate data and it is therefore important to include the relation between IQ and DW. Many influential articles concerning IQ are also conducted with a large focus on DW and tried to establish that DW certainly creates some improvements in IQ, there are still more improvements to be made and many related issues in the area (Watson et al., 2001).

The most important part of a solid DW is, according to Han & Gao (2009), not the technology itself but to establish a sustainable way to ensure information quality. English (1996) states that information quality in a data warehouse is of great importance and that information quality success depends on data cleansing and data-quality improvement. Data cleansing refer to:

*“The process of extracting data from its most authoritative sources, conditioning or reconditioning it to a quality state, and loading into the warehouse. It includes analyzing data to discover its real meaning or use, standardizing the data into atomic attributes, identifying and consolidating duplicates, calculating derived and summary data, and finally loading the data into the warehouse.”* (English, 1996, p. 56)

Data-quality improvements, however, regard the processes of preventing non-quality data from being entered in the first place (English, 1996).

Han & Gao (2009) highlight the fact that too many DW developers start in the wrong end because of their initial focus of creating business intelligence and create analytical analysis or reporting. This cannot be accomplished without dependable data and to create dependable data one needs to go further than just cleaning the existing data (Han & Gao, 2009).

*“If the system consistently annul and fragment the business rules or if the business rules are not well defined, then no amount of work performed in the staging area (preparing, formatting and cleansing data for DW usage) will successfully result in clean data.”* (Han & Gao, 2009, p. 216-217)

The importance of understanding the relation between data variables (Raghunathan, 1999) as well as establishing well-formed business rules and governance processes, to ensure that cleansed data stay clean and qualitative (Han & Gao, 2009; English, 1996) is important in realization of Information Quality.



## 2.6 Information quality

To break down what information quality consists of this section will focus on presenting dimensions of information quality that research literature has identified. This section presents different frameworks and what information quality consists of by different authors. Through a discussion we motivate the choice of one of these frameworks as a starting point for IQ dimensions

### 2.6.1 Information quality and data quality

Before proceeding with the information quality dimensions an important note has to be made. Some of the authors we refer to in this thesis use the word data quality rather than information quality and some use both. However we argue for a combined use of them in this thesis. This combined view is in line with Wand & Wang (1996) who presents an ontological research upon information quality. Wand & Wang (1996) write the following statement in the introduction to their article:

*“Clearly, the notion of data or information quality depends of the actual use of data”*  
(Wand & Wang, 1996, p. 87)

With this quote we argue that Wand & Wang (1996) in their ontological research on information quality dimensions actually combine data and information quality. Further they present dimensions of information quality that can be found in other literature (e.g. DeLone & McLean, 1992) as information quality dimensions. Moreover Strong et al. (1997) presented a framework of information quality dimensions where they use the term data quality. Although in their follow up studies they stated that these dimensions provided comprehensive construct of the multidimensional information quality construct (Lee et al., 2001).

### 2.6.2 Information quality in context

Strong et al. (1997) identify three roles within data manufacturing systems: “Data producers” who generate and produce information, “Data custodians” who provide computing resources to store and manage information and “Data consumers” who use the information.

The authors then define high quality information as *“data that is fit for use by data consumers”* and thus an information quality problem as information that is completely or largely unfit for use. This definition is also widely adopted according to Strong et al. (1997).

Wang et al. (2008), who believe Strong et al. (1997) to be one of the most successful groups in the field and refer to their definition of data quality, continues with stating that information quality is quite easily defined as *“the measure of the agreement between the data views presented by an information system and that same data in the real world.”* The first definition, data that is fit for use by data consumers, concerns the nature of information quality whereas this second definition is a more operational view of information quality (Bertolazzi & Scannapieco, 2001).

According to Bertolazzi & Scannapieco (2001) measuring information quality when defined in an operational way is very hard. Another way to define information quality is to use its multi-dimensional construction; what information quality consists of (Bertolazzi & Scannapieco, 2001). These dimensions will be presented in chapter 2.6.3.

We will use the definition which is concerned with the nature of information quality, that focuses on the fitness of data for data consumers, since this also implies aspects such as usefulness and usability which would be neglected in an operational definition (Strong et al., 1997).

### **2.6.3 Information quality frameworks**

Information quality is commonly seen as an IS success factor (Yeoh et al., 2008; Wand & Wang, 1996; Wixom & Todd, 2005; Ramamurthy et al., 2007). Information quality as a concept itself however is divided into several key characteristics throughout literature (Wand & Wang, 1996; Wixom & Todd, 2005; Ramamurthy et al., 2007; DeLone & McLean, 1992; Wixom & Watson, 2001; Bertolazzi & Scannapieco, 2001).

Following is a summary, in table format, of information quality dimensions as defined by different authors:

Table 2.1 Information quality dimensions

	Wand & Wang (1996)	DeLone & McLean (1992)	Strong et al. (1997)	Wixom & Todd (2005)	Wixom & Watson (2001)	Ramamurthy et al. (2007)
Accuracy	X	X	X	X	X	X
Access security			X			
Accessibility			X			
Amount of data			X			
Availability						X
Believability			X			
Comparability	X	X				
Completeness	X	X	X	X	X	
Conciseness	X	X				
Consistency	X				X	
Content	X					
Currency	X	X		X		
Clarity	X					
Comprehensiveness		X			X	
Concise representation			X			
Convenience		X				
Consistent representation			X			
Credibility		X				
Ease of understanding			X			
Efficiency	X					
Flexibility	X					
Format	X	X		X		
Freedom of bias	X	X				
Importance	X	X				
Informativeness	X					
Interpretability	X	X	X			
Level of detail	X					
Objectivity			X			
Precision	X	X				
Quantitativeness	X	X				
Recentness		X				
Relevance/Relevency	X	X	X			
Reliability	X	X				
Reputation			X			
Scope	X					
Sufficiency	X	X				
Timeliness	X	X	X			
Understandability	X	X				
Usefulness	X	X				
Usableness	X					
Value-Added			X			

In the table above many dimensions are reoccurring throughout the literature and the frameworks have many similarities. Wand & Wang (1996) have the widest range of

dimensions represented in their research. DeLone & McLean (1992) present four dimensions not found in Wand & Wang (1996): credibility, convenience, comprehensiveness and recentness. Strong et al. (1997) present accessibility, access security, amount of data and value-added which are not present in any of the two earlier frameworks. All of the dimensions found in Wixom & Todd (2005) are already represented in Wand & Wang (1996). Wixom & Watson (2001) dimensions were all found in either DeLone & McLean (1992) or Wand & Wang (1996). Ramamurthy et al. (2007) however present one dimension not present in any other framework, namely availability.

Three of the frameworks are more thorough. The DeLone & McLean (1992) article, although having similar dimensions as Wand & Wang (1996), is concerned about IS in general and its critical success factors and not information quality in particular. The article by Wand and Wang (1996) do concern about IS as well but information quality's importance in an IS context is not its main purpose, rather its information quality and definition of its dimensions as such. Strong et al.'s (1997) framework is also focused on information quality as such, just as Wand & Wang (1996). Hence two of the three more thorough frameworks are better aligned with our needs.

#### 2.6.4 Wand & Wang's (1996) Framework

The article Anchoring Data Quality Dimensions in Ontological Foundations (Wand & Wang, 1996) do, according to the authors present a set of dimensions that are well defined and can be used to reason about information quality.

Wand & Wang (1996) proposed an external and internal view of information quality dimensions. The external and internal views are based upon the view of information systems where the external is the use and effect of the information system and the internal is the construction of the information system. In the external view, the system is seen as a black box and it addresses the purpose and justification of the system. In the internal view the dimensions considering the construction and operation necessary to attain the required functionality. (Wand & Wang, 1996)

Wand & Wang (1996) have also divided each view of information quality dimensions into data related and system related. The division can be seen in table 2.7 below:

Table 2.2 Division of dimensions (Wand & Wang, 1996)

View	Dimensions
Internal view	<p><b>Data related:</b> accuracy, reliability, timeliness, completeness, currency, consistency, precision</p> <p><b>System Related:</b> Reliability</p>

<b>External view</b>	<p><b>Data related:</b> timeliness, relevance, content, importance, sufficiency, usability, usefulness, clarity, conciseness, freedom from bias, informativeness, level of detail, quantitateness, scope, interpretability, understandability</p> <p><b>System Related:</b> Timeliness, flexibility, format, efficiency</p>
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### 2.6.5 Strong et al.'s (1997) Framework

Strong et al. (1997) divide their information quality dimensions into four categories intrinsic, accessibility, contextual and representational. The categorization is found in table 2.8 below.

Table 2.3 Categories and dimensions (Strong et al., 1997)

Category	Dimensions
<b>Intrinsic</b>	Accuracy, Objectivity, Believability, Reputation
<b>Accessibility</b>	Accessibility, Access security
<b>Contextual</b>	Relevancy, Value-Added, Timeliness, Completeness, Amount of Data
<b>Representational</b>	Interpretability, Ease of understanding, Concise representation, Consistent representation

The intrinsic category refers to the mismatch among sources of the same data. Figure 2.1 gives an overview of this category, the dimensions in it and the relations between them by illustrating the intrinsic pattern of data quality problems. Strong et al. (1997) illustrate how the lack of quality in one dimension affects other dimensions.

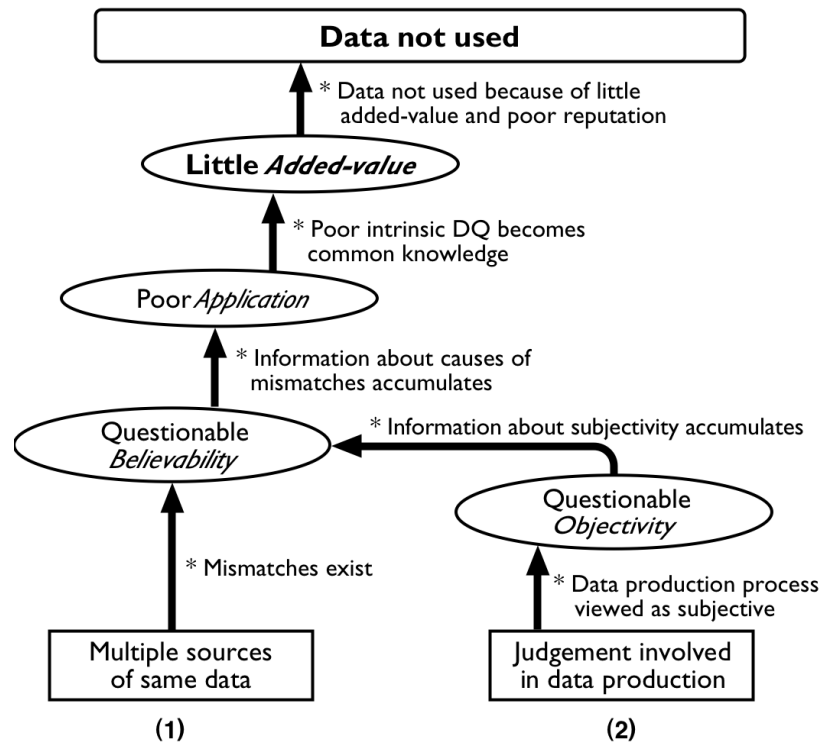


Figure 2.1 Intrinsic DQ problem pattern (Strong et al., 1997, p.105)

Pipino, Lee and Wang (2002) have given a definition to all of the dimensions which they used in Strong et al., (1997). In table 2.9 below you can find their definitions of the dimensions in order to give a better understanding of their nature.

Table 2.4 Summary of Intrinsic dimensions

Dimension	Explanation
Accuracy	The extent to which data is correct and reliable (Pipino et al., (2002) refers to this dimensions as “Free-of-Error”) (Pipino et al., 2002). Is not represented literally in fig 2.1 but lack of it is a source of questionable believability and mismatches.
Believeability	The extent to which data is regarded as true and credible (ibid).
Objectivity	The extent to which data is unbiased, unprejudiced and impartial (ibid).
Reputation	The extent to which data is highly regarded in terms of its source and content (ibid).

The accessibility category relates to how accessible the information is to the user. Strong et al. (1997) further involves dimensions from category three and four as barriers to information accessibility. This is visualized in fig 2.2. below.

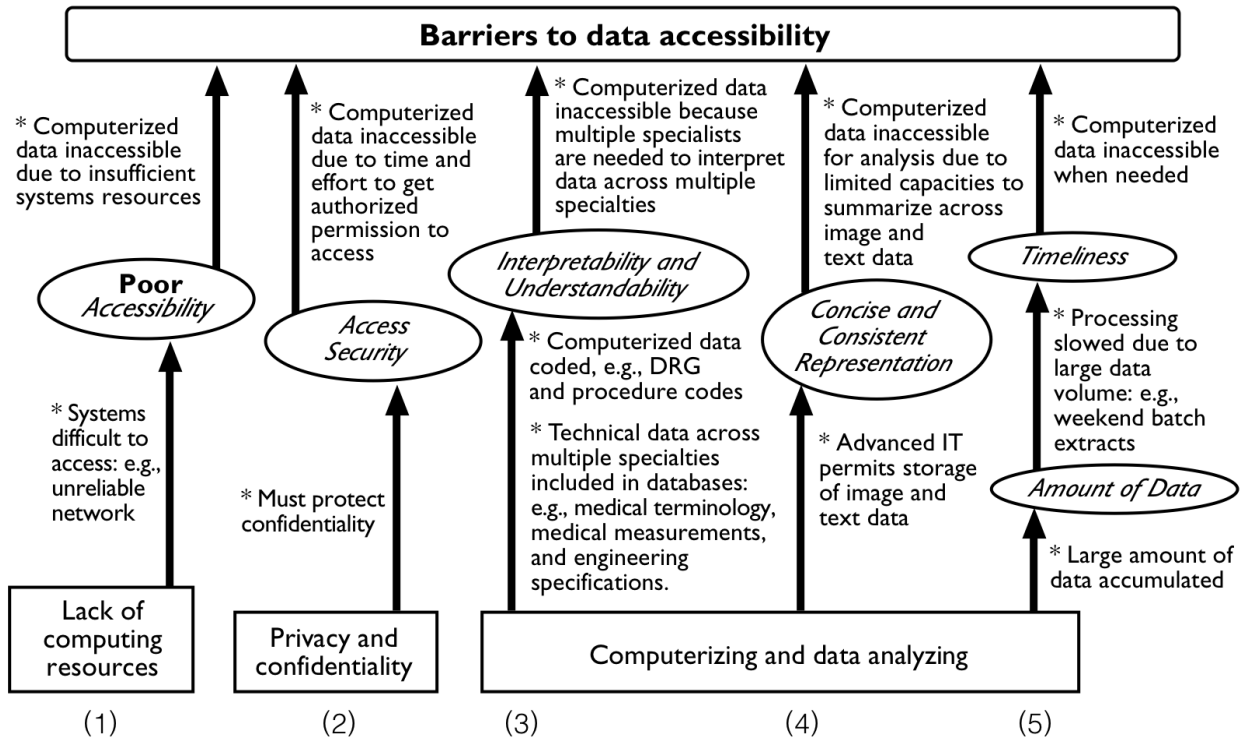


Figure 2.2 Accessibility DQ problem pattern (Strong et al., 1997, p.106)

Table 2.10 defines the dimensions corresponding to the accessibility category as described by Pipino et al. (2002).

Table 2.5 Summary of Accessibility dimensions

Dimension	Explanation
Accessibility	The extent to which data is available, or easily and quickly retrievable (Pipino et al., 2002).
Access security	The extent to which access to data is restricted appropriately to maintain its security (ibid).

The third category presented by Strong et al. (1997) is the contextual category. This category addresses problems where the user complains about utilization of the information. Fig 2.3 gives an overview of this category.

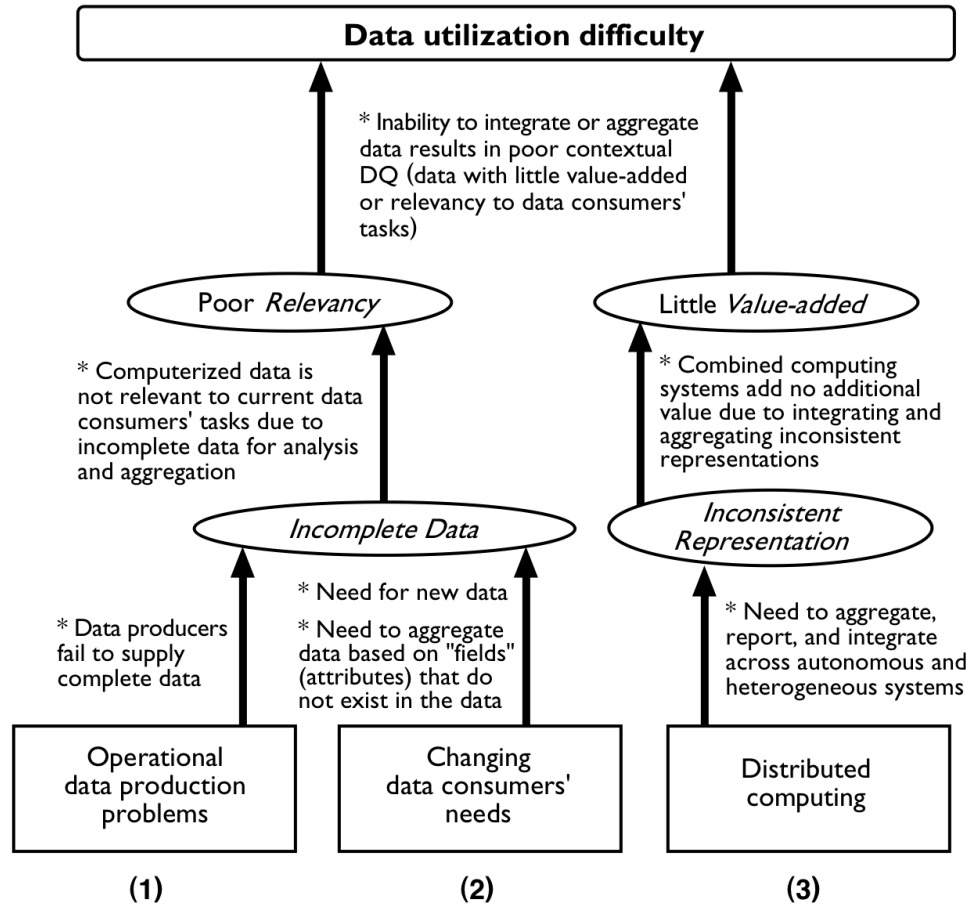


Figure 2.3 Contextual DQ problem pattern (Strong et al., 1997, p.106)

Table 2.11 defines the dimensions corresponding to the contextual category as described by Pipino et al. (2002).

Table 2.6 Summary of Contextual dimensions

Dimension	Explanation
Completeness	The extent to which data is not missing and is of sufficient breadth and depth for the task at hand (Pipino et al., 2002).
Relevancy	The extent to which data is applicable and helpful for the task at hand (ibid).
Timeliness	The extent to which the data is sufficiently up-to-date for the task at hand. Also includes currency which is concerned about the delivery time of the information. (ibid)
Value-Added	The extent to which data is beneficial and provides advantages from its use (ibid).
Amount of data	The extent to which the volume of data is appropriate for the task at hand (ibid).

The fourth and last category presented by Strong et al. (1997) contains the representational dimensions. This dimension does not have a model explaining it; however all of its



dimensions are represented in fig 2.3 and are affecting the accessibility of the information. Strong et al. (1997) states that the representational dimensions of information quality are possible barriers to accessibility.

Table 2.12 defines the dimensions corresponding to the representational category as described by Pipino et al. (2002).

**Table 2.7 Summary of Representational dimensions**

<b>Dimension</b>	<b>Explanation</b>
Interpretability	The extent to which data is in appropriate languages, symbols and units, and the definitions are clear (Pipino et al., 2002).
Ease of understanding	The extent to which data is easy to comprehend (ibid).
Concise representation	The extent to which data is compactly represented (ibid).
Consistent representation	The extent to which the data is presented in the same format (ibid).

According to Strong et al. (1997) their findings may be used as an empirical basis for building information quality theories about the nature of organizational information quality problems and their solutions. Follow up studies on these information quality dimensions has proven them to provide comprehensive coverage of the multi-dimensional information quality construct (Lee et al., 2001).

## **2.7 Result of Literature Review**

We have in this section explained the wide term of business intelligence by describing its fundamental working process of getting data in and out (Watson & Wixom, 2007), mentioning some application areas (List 2.1) and what BI consists of (List 2.2).

As presented, both the terms BI and DSS are content free expressions (Turban et al., 2007) and this paper will not try to engage in the discussion of their definitions and further distinguish these two terms or limit the focus to one area. This is also because the core of this thesis is about information quality that is relevant to both BI and DSS (Turban et al., 2007; Power, 2007). The focus lies within Business Intelligence throughout this paper but also implies high relevance to DSS and especially Data Driven DSS.

Data and information have been presented as vital parts of business intelligence which lead us in to the concept of information quality. Important aspects of information quality were addressed before we presented a more detailed research of the information quality definition through dimensions (Section 2.6.3). These aspects included the importance of organisational process to maintain information and improve insertion of information through business rules etc. (English, 1996; Han & Gao, 2009). By avoiding information quality problems one can improve the users' ability to make sound decisions (Strong et al., 2009).

We have also presented six frameworks about information quality dimensions (table 2.1 – 2.6). The frameworks had many common dimensions but Wand & Wang (1996), DeLone & McLean (1992) and Strong et al. (1997) were more detailed than the others. Two of the frameworks, Wand & Wang (1996) and Strong et al. (1997), are more focused on information quality and have therefore a purpose that better suited our needs. The major difference between Wand & Wang's (1996) and Strong et al.'s (1997) frameworks, is the use of the dimensions. Strong et al. (1997) places their dimensions inside a context by invoking them into models (fig 2.1 – 2.3), explaining different categories of information dimensions, namely intrinsic, accessibility, contextual and representational. Lee et al. (2001) has further proven the multi-dimensional information quality framework to provide a comprehensive coverage.

We believe Strong et al.'s (1997) framework to be the preferred basis for our thesis since the presentation of its dimensions and explanation of these makes it both easier and more straightforward to work with thus limiting the risk of misunderstanding and errors. Because of the arguments above we will use Strong et al.'s (1997) framework as the basis for our research. Although the theory found in other frameworks might still be of value for our future analysis.

### 3. Research Method

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*In this chapter we will describe the approach and practical procedures of this study and how we got from “here to there”. After having reviewed the literature of this topic and having formed a theoretical base for this study, we proceeded with developing a research design that suited our research question: How is information quality realized in business intelligence systems? To provide the reader with a clear picture of our practical approach we will describe and discuss the issues and choices made concerning the methodological approach, data collection methods and quality aspects, such as reliability, validity and bias.*

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#### 3.1 Approach

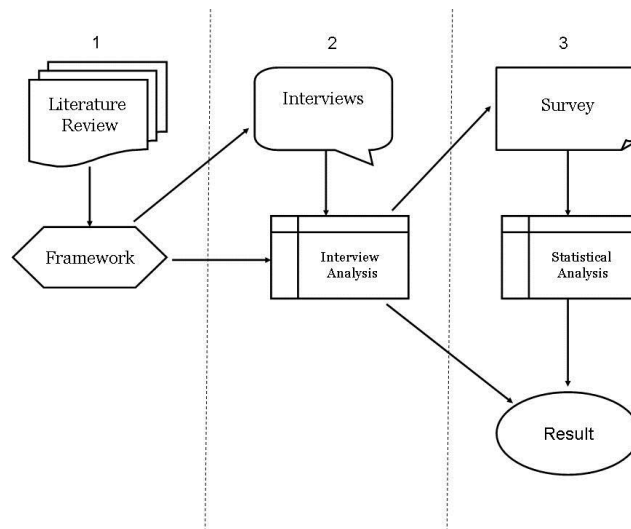
This study employed in-depth qualitative interviews, followed by a quantitative survey as a second process thus using multiple sources to answer our research question. This approach has similarities with what Bryman (2002) describes as a combination of qualitative and quantitative approach. To support us in our process we had a case company that provided us with interviewees and also access to external participants for the survey. A large amount of data was accessed through the case company which was our starting point for the empirical findings of this study. This company is further described in section 3.1.2.

Similarities in this approach can also be found in what Yin (2003) describes as a case study approach. Yin (2003) encourages the use of both quantitative and qualitative methods in a case study approach to examine an issue or phenomena that is closely related and hard to separate from its context. However we do not apply a case study, because we do not find the context and company to be that tied to each other. In our study, we merely used the company partly as a source for data collection and a gateway to external information. The company used in our study is therefore more in line with what Bryman (2002, pp.66) states as a “...*coulisse or background for the result, not the focus of the study.*” However, because of the similarities with the case study approach and the extent of which the company and its context are used, we made sure to consider the implications of a case study approach to improve the transparency and quality of the research. The implications of these considerations and measures taken are further described in the following sections where we for example present the company and discuss potential risks of bias.

Instead of a case study approach this thesis focus on the combination of both interviews and survey because it enabled us to accumulate knowledge from literature, experts and from a number of users. The findings in these three phases enabled us to form a multidimensional point of view of how information quality is realized. The interviews enabled findings of how IQ can be realized whereas the survey indicated if the information quality dimensions actually had been realized. These two research angles were therefore used to answer our research question: *How is information quality realized in Business Intelligence systems?*

### 3.1.1 Procedure

We divided the research design into three phases as presented in fig 3.1 below.



**Figure 3.2 Research model**

The major step in the first phase was a literature review where important areas and concepts were identified as well as different frameworks for information quality. The literature review resulted in the choice of an information quality framework which consists of several information quality dimensions. We motivated our choice by conducting a critical review of a multiple range of sources to find the framework that suited our needs the most. This framework by Strong et al. (1997) laid the foundation for how to structure the extraction of empirical information and the analysis steps in phase two and three. The chosen framework has therefore thematized the layout of the major parts of this thesis.

The main steps of phase two were the interviews and interview analysis. The four categories in our framework, and their dimensions, were used to develop an interview guide to enhance the outcome of the interviews. The interviews were carried out with established BI developers in the field to explore how the IQ dimensions in our framework are realized. Through an analysis of these interviews we were able to establish a further view of these dimensions within each category. By investigating the dimensions from a developer point of view we could find indications of important variables within these dimensions which we could base our survey questions on. The analysis of the interviews addressed each category from the Strong et al. (1997) framework one at the time and shows the related propositions for survey questions in the end of each section. Also a proposition of relationships between the dimensions from Strong et al. (1997) and the findings in the interviews is presented in the end of chapter 4.

The survey, which was based on the framework by Strong et al. (1997) and the outcomes from the interviews, provided a view of the realization of IQ in BI systems from an end-users point of view. The dimensions and variables found in our interviews were used to ask BI users about information quality in such terms that maybe could be easier to understand

because of the use of more everyday terms. This approach enables a comparison of both the end-users and developers views on information quality realization in BI systems.

We believed that dividing the procedures into three steps and combining them would be helpful in providing a complete description that could answer our research question. By using qualitative interviews with developers we were able to obtain a deep and rich picture of the issue, from experts that have both experience and knowledge of the field. The quantitative end-user survey provided a wider selection of answers and data that enabled further analysis of the realization of dimensions and its importance.

For convenience this chapter will itself also follow the same structure as the research design. Chapter 3.2 address both the interviews and the survey phases, chapter 3.3 however focuses solely on the interviews whereas chapter 3.4 focuses solely on the survey.

### **3.1.2 Case company**

In this study we worked with a company called Ortelius Management AB, who specializes in BI development and information management consulting. Ortelius was founded in 1999 and is therefore not a very old company but their employees do however possess considerable experience and knowledge in the field of information systems. They present themselves as a unique company where their vision of a sustainable model for information handling (i.e. be able to model the information in an organisation dynamically so the information systems can handle major structural changes when the organization changes) has given them a good position in the market. This vision and their concept of building Business Intelligence tools based on an organization wide common points of reference, caught our attention. The possible selections of cooperating companies was however also limited but we choose to cooperate with Ortelius because of this new and innovative way of thinking about information handling when developing BI tools. We felt that their core competence is their innovative thinking as they approach the modelling of organizational information differently than we have seen through education. We thought that this could give us interesting empirical material in our interviews which could result in an interesting comparison to the actual realization of information quality.

## **3.2 Research Quality**

We will throughout the next sections present how we have worked with the important terms of validity and reliability that are strongly related to the scientific quality discussion (Creswell, 2007; Seale, 1999). We also discuss the areas of Bias and Ethics that is also related to the research quality of our thesis.

### **3.2.1 Validity**

Throughout this report we have tried to uphold a high level of transparency and a clear chain of evidence to achieve validity. We have also taken some guidance from the concept of

triangulation which contributes to increased validity as well (Section 3.2.3). These three aspects are presented by Yin (2003) as a good way of dealing with validity.

One way of upholding transparency was that we considered the surrounding factors of the company and provided a description of the context in an attempt to ensure both good transparency and its effect on our research.

In the second phase, the contextual factors are more imminent because our experts came from the same company. We therefore considered it important in section 3.1.2 to not just present the case company but also describe some of its aspects to improve the transparency in the report. In relation to this context we also discuss the issue of bias in our report in section 3.2.4

In our thesis, we also have put a lot of effort in understanding the context and subjects and developing interviews where the questions are closely related and rooted in the theoretical concepts, thus hopefully providing answers that are connected to the concepts. According to LeCompte & Goetz (1982) and Bryman (2002) the connection between the theoretical concepts and the empirical observation is a way to measure the internal validity of the research. According to Bryman (2002) the internal validity can be hard to achieve in surveys because of their troubles with providing causal results. However, the combination of both interviews and survey as in our study may accordingly to Bryman (2002) increase the internal validity.

In this thesis we clearly describe and define the characteristics of the case and context of the study, so that the translatability to other contexts is facilitated. By clearly displaying our research context and our procedures we hope that the possibility of generalization and external validity, as described by LeCompte & Goetz (1982) and Bryman (2002), is satisfied to the extent possible in our study.

To further increase the external validity in our survey we worked with obtaining a random sample of participants, which according to Bryman (2002) is important for the external validity. The survey sampling is described further in section 3.5.3.

### **3.2.2 Reliability**

The quality of interview is also important for the quality of the following analysis, results, verification and reporting of the findings. However, in comparison to other well-established methods of a more quantitative approach, the qualitative interview doesn't have as well-defined or obvious ways of measuring quality or even the practical procedure. (Kvale & Brinkmann, 2009)

However there are ways of reaching research quality and quality measures that can be used for both qualitative and quantitative research. We have tried to uphold a high level of transparency throughout this thesis and clearly describe and define our purpose and practical approach to facilitate future replications of the study, which is one way to judge the external reliability according to Bryman (2002). Since, we are three researchers or observers we tried to utilize this by using multiple observers for the collection and interpretation of the data.

Before we conducted our study, we also discussed and defined a common point of reference and judgement of how we as a research team should relate to and analyze our findings of our interviews and survey, to avoid a clash between how we judge and interpret data. By doing this we addressed the issues of what LeCompte & Goetz (1982) describes as internal reliability as well as what Bryman (2002) refers to as inter-observer consistency. For our surveys we also used the Cronbach alpha and calculations of correlation coefficients to measure the extent of internal reliability.

### **3.2.3 Multiple perspective**

By using different sources and methods for the data collection we have tried to triangulate and corroborate our findings with as much transparency as possible hence increasing the quality and trustworthiness in the research evidence as suggested by a number of authors (Creswell, 2006; Denzin, 2009; Oates, 2006; Seale, 1999).

In order to create a clear line or relation between the research's claims and evidence, one can apply triangulation which implies the use of more than one point of reference or source to increase the reliability in the finding. It is also implied that the use of triangulation can mitigate the risk of bias. (Seale, 1999)

We used both qualitative and quantitative methods to triangulate our findings as proposed by Bryman (2002). By first using the qualitative interviews with developers and thereafter performing a survey with a wide range of end-users we produced results and evidence from different points of reference. These results could then together form triangulated findings.

If a match was found between the two sources it could corroborate our findings. However, a mismatch would show an inconsistency hence implying that our findings from the two methods didn't concur. A mismatch or contradiction between the results could imply a difference between the developers and end-users view, which would be as valuable as a matching result. Hence, we believe that the use of two methods and enabling of triangulation could serve us both in corroborating as well as in contradicting the findings.

In our study, we also applied multiple investigators triangulation by being three investigators involved in the study, which according to Denzin (2009) and Seale (1999) can reduce personal bias and findings can be corroborated or rejected by comparing each other's findings and continuous discussion throughout the work.

### **3.2.4 Bias**

We have previously presented how we have worked with the important aspects of validity and reliability. Another practical way of considering validity is, according to Norris (1997), to focus on error and bias, which no research is immune from. We address the possible bias in our research by reflecting and presenting our position as researchers.

*“A consideration of self as a researcher and self in relation to the topic of research is a precondition for coping with bias.”* (Norris, 1997, pp. 3)

The search for information and knowledge in our research process is improved by keeping an open mind and “pursue the research in the way ‘anyone would pursue it’” (Hammersley & Gomm, 1997). It is also very important to be self-critical throughout the entire work (Norris, 1997), we have therefore tried to have continuous discussions between the team members and look at our work with critical eyes. We have also constantly questioned and in this paper discussed the pros and cons of our method procedures and our findings. This is also in line with our use of triangulation presented above. It is however a confirmed problem to really be able to assess oneself and the bias within (Ehrlinger, Gilovich & Ross, 2009). We have therefore tried to apply the advice from Ehrlinger et al. (2009) as well as Norris (1997) and let participants, tutors, scholars and other outsiders review the different sections of our work.

We have throughout the work tried to keep to the right track and follow the path we have laid, but we have also tried to be aware of when we have deviated from the planned route and to analyze why, how and what implications it has had for our result and study and thereafter try to find a way back to the right track.

Since it can be hard to be self-critical and to avoid bias we have tried to uphold a high level of transparency by presenting, in detail, our method, case company, empirical material and chain of evidence, and therefore be able to reveal possible traces of bias in our work. We also tried to address the quality issues of validity and reliability and made sure to apply quantitative measures available to evaluate the quality of our survey and results.

### **3.2.5 Research Ethics**

In an early stage of the creation of our research approach we considered the ethical implications of our work. The ethical considerations were important to nurture our relationship with our case company and “promote the integrity” (Israel & Hay, 2006, p. 5) of our research and research in general.

We applied the principles of informed consent to conduct an ethical research with our interviewees and survey participants (Kvale, 1996). We drafted an interview agreement which served as a protocol and assurance that our interviewees were aware of certain aspects and had the opportunity to choose if they wanted to be anonymous (Appendix B).

In phase two, we first presented our purpose to the case company who then produced three suitable and interested subjects. We then sent chapter one, two and three of this report to further present our purpose, intentions and procedure. We also sent the interview guide to allow the subjects to be aware of what we intended to ask about, to further establish informed consent. We felt that this would not affect the answers or data extracted from the interviews in any majorly bad way and it was more important to have informed and comfortable subjects. The survey participants received a short introduction in relation to the



survey explaining the purpose and that the answers would be anonymous, which we believed to be sufficient in the sense of informed consent for the survey participants.

We provided the participants in the interviews with a letter of agreement, where they had the opportunity to choose if they would want to be anonymous or not. We also had a discussion with the interview participants and the company regarding anonymity and confidentiality, making sure we were on the same page and establishing the preferred level of confidentiality.

Further, we also considered the implications of our research for research subjects and other subjects and stakeholders, as suggested by Israel & Hay (2006). We concluded that the consequences of our research and fulfilled purpose should be positive for all stakeholders. We did however consider if it was possible that our result could in any way damage our case company by for example showing a lack of skills in the area. These considerations were discussed with our case company who agreed that they and their employees could only benefit from such a finding.

### **3.3 Interview Procedure**

As stated above, the interviews were used to provide the view of the realization of IQ dimensions in BI systems from a developer's point of view, creating an in-depth picture.

#### **3.3.1 Semi-structured Interviews**

We applied a structure of interviews where we had a pre-defined set of questions mined from the literature (Appendix A). These provided the frame for the interviews, but also allowed us to explore unexpected leads and giving the interviewees some space, which is similar to what Oates (2006) describes as a semi-structured interview. The semi-structured interviews use a set of prepared topics but not a specific without a specific order, creating a more natural-like conversation (Oates, 2006).

#### **3.3.2 Developing questions**

Our questions were based on the chosen information quality framework by Strong et al. (1997). Our choice to apply a concept-driven, further described in chapter 3.6, guided us to formulate the questions in our interviews in a way that would enable us to find both support for dimensions as well as new findings.

More precisely the questions were developed through a discussion among all three authors, applying the dimensions and categories from the Strong et al. (1997). We systematically went through the theory and discussed the disposition and formulation of the question. This joint systematic formulation of questions allowed us to consider different perspective of all three researchers and also provided us a quality check auditing each other and revising the questions from a multi-perspective. After revision and iterative auditing and discussion between the three team members we compiled the final set of questions. The question were then grouped into categories for every dimension.

The first questions in our interviews were not formulated out of our true purpose of the interview. They were more general and had a purpose to make the interviewees feel comfortable, which is an important aspect of the interview according to Kvale & Brinkmann (2009). The same technique was used after the interviews, where we did a summarization of what was said and learned during the interview, a so-called debriefing (Kvale & Brinkmann, 2009).

### **3.3.3 Participants and sampling**

When choosing our interviewees we considered two aspects where the first should be their knowledge and expertise in the area to be able to relate to our area and questions and provide further implications of our framework. The second aspect was their representation of a normal BI developer. These strategies are in our view similar to what Creswell (2007) calls theory based and typical case based sampling. It was therefore important to consider the subjects' previous experience and knowledge of the field. Also we wanted to obtain a good mix of interviewees, representing a typical developer. We therefore combined a very experienced subject with a subject who has much experience in the IT field in general but not as much in the BI field.

The interviewee in interview A was Stefan Dageson, Business Architect and Senior Partner at Ortelius Management AB. Mr. Dageson has over 20 years of experience in system development and especially within the field of information management and business intelligence.

Our second interviewee was Tove Nilstun an experienced developer. She has worked 3 years at Ortelius Management AB but has good knowledge about the subject from earlier workplaces as well.

### **3.3.4 Conducting the interviews**

When conducting the interviews we used settings that were familiar to the respondents to make them comfortable and relaxed. Also, the interviews were audio recorded, facilitating the following transcription activity, which is recommended by both Kvale & Brinkmann (2009) and Bryman (2002). Also an initial briefing, explaining the purpose and procedure was made and afterwards a debriefing where the interviewee could reflect whether he or she had any question marks or anything to add.

### **3.3.5 Analyzing the Interviews**

After conducting the interviews we transcribed the recordings to facilitate the analysis and coding, as recommended by Kvale & Brinkmann (2009). Firstly we compiled a detailed transcription of the natural oral conversation with pauses and stutters. The transcriptions were then refined, concentrating sentences and removing coughs, hesitations, repetitions etc., to develop a more comprehensive transcription. Because the stutters and the

interviewees' exact way of speaking is not the focus of our analysis the more refined transcription is more suitable for our analysis. This also implies less information to analyze but such a deep analysis where pauses and sentenced constructions are considered is outside the scope of this thesis.

After transcribing the interviews we coded the data from the interviews based on a set of predefined codes presented below in table 3.1 and 3.2. Initially we identified three major themes, irrelevant, general description and relevant for the question (Table 3.1). Identifying these key themes provided a good general impression of the data (Oates, 2006). The relevant data was then coded to categorize the data and match them to the dimensions presented to in the framework by Strong et al. (1997). In our coding and analysis we kept the possibilities of new dimensions and categories open (i.e. table 3.2: OI, OA, OC, OR and UC). This coding procedure is supported by the strategy of concept driven coding (Kvale & Brinkmann, 2009) and open coding (Seale, 1999).

Irrelevant - IRR		Description - DESCR		Relevant - REL
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Table 3.1 General coding scheme for interview analysis

Intrinsic I		Accessibility A		Contextual C		Representational R	
Accuracy	IA	Accessibility	AA	Relevancy	CR	Interpretability	RI
Objectivity	IO	Access Sec.	AAC	Value-added	CV	Ease Of Understanding	RE
Believability	IB	Other	OA	Timeliness	CT	Concise Representation	RCR
Reputation	IR			Completeness	CC	Consistent Representation	RCTR
Other	OI			Amount of data	CA	Other	OR
				Other	OC		
Undefined Category = UC							

Table 3.2 Specific coding scheme for interview analysis

Each author constructed their own coding scheme and a comparison and discussion then led us forward in our analysis. This analysis is presented in chapter 4 where each category and its dimensions are analyzed. In our analysis we considered the relation of our findings to the literature but did however not raise a discussion. Since our data was coded in relation to the IQ framework we did not involve any other discussion of its possible relation to the literature presented in chapter 2. The findings of our interviews and their relation to the literature are instead discussed in chapter 6 together with our survey findings. The analysis focused solely on finding ways, procedures or factors mentioned in the interviews, which were used to construct survey questions. This analysis resulted in a figure of relations between factors and the IQ dimensions (Figure 4.1). The survey questions were based on this figure.

### **3.4 Survey Procedure**

The survey was targeted to end-users of BI systems. As shown in fig. 3.1 the survey is chronologically situated after the interviews both verifying and testing the findings in the interviews and literature by statistical analysis. The survey had the purpose to see whether or not different findings in the interviews actually are realized in BI-systems. The framework found in literature was however still intact and the dimensions in it was fully tested for realization in the survey. If the interviews had a purpose of exploring how information quality was realized, in what way and with what techniques, the survey had a purpose to find out whether or not this was realized in actual systems.

A statistical analysis was performed on the data collected from the survey. Necessary quality measures were also used, such as Cronbach alpha and determination of correlation between variables, to show the extent of reliability and validity of the survey and its results.

#### **3.4.1 The survey**

The type of survey used in this study was a web-based survey, which facilitated the distribution of the survey to a wide range of participants regardless of their geographical location and when they answered the survey. This type of survey was something that we found as effective both for us and the participants, allowing flexibility both in distribution and participation.

The survey was divided into five parts. The first part had the purpose to inform the participants in the best way we could by providing them with an introduction of the purpose and practical implication of the survey and explaining the terms and topics used. They also answered whether or not they used a system corresponding to how we described BI systems and gave us the name of their system. The second part of the survey was concerned about questions regarding the intrinsic category of dimensions (see tbl. 2.9) and findings linked to these dimensions from the interviews. The third part continued with the accessibility dimensions (tbl. 2.10) corresponding to the second part and so on with the fourth asking about the contextual dimension (tbl. 2.11) and the fifth and final part asking about the representational dimensions (tbl. 2.12).

#### **3.4.2 Developing the survey**

The survey was constructed based on findings of the interviews as explained in section 3.3.6. When we had analyzed the interviews we extracted survey questions from our findings. This was done category by category of dimensions. This resulted in a quite large number of survey questions. The questions were examined to find a good balance between number of questions and the possibility for thorough results. Although we found common factors important for multiple dimensions we only asked about one factor or dimension one single time. This was done to ease the answering of the survey and enable the use of regression analysis. At the end we drew a map of how the factors and dimensions were related in order to give a possible base for analysis of the survey. We also went back to our interviews and literature again to see whether or not we had missed any important relation or factor.

We aimed at keeping the questions in the survey as clean and easy to understand as possible in order to get an as good result as possible. This meant that some terms had to be explained in a short and concise way instead of using the term itself.

### 3.4.3 Population and sample

The population that was addressed with the survey consisted of users of BI systems. In order to find our respondents we contacted people connected to BI users. Although we cannot give any further details where these respondents work or who they are since the survey is completely anonymous. Because of the difficulties of defining the population of decision-making BI system users, we used participants that we got access to through our case company and respondents in our initial interviews, but also through other channels we found. This is similar to what Bryman (2002) calls the snowball sampling, where the sample may not be very random because one does not know what the population looks like and the only way to find respondents is through the connections you have. However to ensure their relevance for our survey the first question ensured that they used a system corresponding to our view of BI and the second required the participant to enter the name of BI tool or tools they use. The issue with this sampling strategy is that it can be hard to generalize and reflect the population which we have considered when presenting our result.

### 3.4.4 Analyzing the Survey

For the survey we used a software program known as Statistical Package for the Social Sciences (SPSS), an analytical tool with which we performed a number of statistical analyses both for the analysis of relations as well as quality measures.

Firstly we computed the mean values and the standard deviation of all the questions in the survey. These were used to show the rate that the respondents put on each question and consequently quality dimension. The standard deviation showed us how the responses varied and within which range the most responses fell. These values indicated how well the different dimensions and variables are represented for users, hence showing a first glance of the realization of quality.

Moreover, the method of linear regression was used to analyse the relationship between the independent variables that were indicated in the interviews and the dependent variables of quality dimensions found in literature. The relations between these variables are further explained in chapter 4.4.5. Because we wanted to examine the relationship and affect between the identified variables and quality dimensions we believed that a linear regression would serve us well because of its ability to find the line that best fits the relation between two variables. The linear regression has been extensively used in research and statistics and is a technique for different types of goals such as prediction, forecasting, hypothesis-testing etc. (Anderson et al, 2007).

To show how well-suited the variables are for measuring the construct that was studied we used the Cronbach alpha. Cronbach alpha measures the internal consistency and reliability,

which is connected to the correlation between the variables (Rudner & Schafer, 2001; Bryman & Bell, 2003). The higher correlation between variables, the higher the Cronbach coefficient is.

The graphs and values from both the regression and the other measures and test results will all be provided in the analysis.

### ***3.5 Self-criticism of chosen method***

We have throughout this chapter presented our method and argued how it was a suitable approach to create results and an answer to our research question. Our approach with a combination of interviews and surveys allowed us to extract knowledge in different ways but also created some problem areas that are discussed below.

The fact that both our interview subjects are from the same company can raise the question of bias and generalizability of our interview findings. We have therefore worked with transparency by highlighting the possible contextual influences as well as considering this aspect and limit ourselves in the generalizability of our result. The established framework by Strong et al. (1997) is used as a strong foundation which we never intended to adapt or reconstruct. This has provided us a structure that can be reused as well as limit any biased views in our interviews.

The connection between our interview subjects and the BI user is another aspect of this approach that can be discussed. In our thesis the connection between the developers and the users is Business Intelligence tools in general. Another approach could have led to a more specified setting and connection where for example the users asked only use the tools constructed by the developers. The case study approach was however not suitable because of our intentions to retrieve a more general picture of the problems in IQ realizations.

## 4. Interview analysis

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*In chapter 2.6.2 we presented our framework taken from Strong et al. (1997). The framework consists of four categories, namely intrinsic, accessibility, contextual and representational. In this chapter we will present our interview findings and link these into each dimension in its proper category. Each category makes up one chapter and each chapter is concluded by a short concluding remark concerning the findings and how to proceed with these findings in the survey. Interview A is with Mr. Dageson, interview B is with Miss Nilstun and C refers to a follow up email with Mr. Dageson. The coded interview transcripts are found in appendix C*

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### 4.1 The Intrinsic dimensions

#### 4.1.1 Accuracy

Miss Nilstun describes accuracy of information as crucial for an information to be qualitative but reflects about accuracy more in relation to its currency and how well updated it is. [B:30; B:32]. Mr Dageson also believe accuracy to be one of the major reasons to why information quality is important because it enables the user of the information to create a good and proper picture of how the reality looks like and how it will look like in the future [A:10]. He believes that the accuracy of the information is an essential part in BI systems although you never can reach the whole truth [A:12, A:14]. In order to achieve accuracy in the information of a BI system, one must find techniques that manage to describe the reality in a proper way. These techniques also have to allow the information to evolve and change dynamically together with the organisation and reality which changes over time in order to keep its accuracy [A:18].

#### 4.1.2 Believability

Miss Nilstun explains that believability is based on the user's belief that the information is correct and that many people in decision making positions do not believe in the information and therefore rely on "gut feeling" instead [B:59] According to Mr Dageson believability in information is achieved by the user being able to trust in the information [A:29]. Mr Dageson explains that if the user knows that the right persons has the right responsibility and that this person has described the reality in a sufficient way the user will consequently also trust the information at hand [A:29]. In order to achieve this, the information has to be transparent, the user has to be able to see from where the information resides, its source [A:31]. In order to achieve this transparency the information should pass as few steps as possible along the way from the source to the user [A:31]. This is also a problem in today's BI systems where the information is too far away from its source [A:33]

### 4.1.3 Objectivity

Objectivity is also something Mr Dageson considers to be important and the information should be described out of its source and in its true nature as far as possible [A:20]. Objectivity is something important when information is created at the source [A:21], and it is also something that Mr Dageson tries to implement and work with [A:27]. Miss Nilstun exemplifies the problems within objectivity by mentioning the entering of abbreviations and ambiguous terms and such areas need to be structured to avoid subjective information [B:132]. Mr Dageson further explain that to prevent subjectivity and improve objectivity one has to stop thinking cleansing of information and rather do things right from the start, information should be registered and created according to a certain pattern agreed upon in the organization [A:25]. Miss Nilstun does in addition believe that there can still be a value of subjectivity and that there is a difficulty in capturing people's subjective knowledge and inputs so the whole organization can use it objectively. A well defined information structure is the most efficient instrument to homogenize subjectivity into objectivity [B:43] It is also important to have routines for updating the information so the updating does not rely on a person's subjective view of when something new needs to be added. [B:100]

### 4.1.4 Reputation

Mr Dageson states that the reputation of the information is strongly connected with its believability, its completeness and again that the information is close to the source [A:33]. Miss Nilstun also explains that organisational factors affect reputation because of the relations between, for example departments and people within a firm. [B:137] Mr Dageson says that good reputation is achieved by how he describes accuracy, believability and objectivity [A:33].

### 4.1.5 Developing survey question from the Intrinsic category

According to our interviews accuracy is an important dimension to achieve information quality. It is realized by describing the reality in a proper way and that this description has the ability to change dynamically within the system. From this we extract two survey questions linked to accuracy:

1. The information in my system is accurate.
2. The information in my system has the ability to change dynamically together with reality.

Believability is according to our interviews achieved by trust. Trust on the other hand can be achieved by what our respondent calls transparency, that the user can tell from where the information resides and that the information passes few steps along the way to its user. From this we extract two survey questions linked to believability:

3. I trust the information in my system.
4. I am able to tell from where the information that I use resides.



Objectivity has been said to be important in our interviews and is achieved where the information is created. In order to achieve objectivity the information needs to be created according to a certain standardized pattern and in a way so that it captures the information's true nature. From this we extract two survey questions:

5. The information in my system is objective.
6. We have standardized routines for how to create information.

Reputation is according to our interviews achieved by representation of the other intrinsic dimensions. Hence from this dimension we extract one survey question:

7. The information in my system has good reputation.

## **4.2 Accessibility**

### **4.2.1 Accessibility**

Maximum accessibility would, according to Miss Nilstun, be the possibility to retrieve everything you need through the BI system in real time [B:71]. Problems with accessibility can according to Mr Dageson originate from two sources. Either the information resides in a very large system which has often with diverged and hard to grasp information structures. The second source can be that small departments inside the organization have bought their own BI system creating their own little island isolated from the rest of the organization [A:35]. In the structural problem the accessibility problem of information might be that it's hard to find the information whereas in the isolation problem it might be technically impossible to retrieve the information [A:37].

Moreover additional work where you need to further compile the information or order it in advance would make it less accessible [B:71]. Another important accessibility factor is the access to tacit knowledge that exists within people. To make this information accessible and lessen the importance of key persons is, according to Miss Nilstun a big problem for companies today. [B:71] In order to solve the problems with information accessibility Mr Dageson states the importance of structure and to create a common way of communication within the organization [A:39].

### **4.2.2 Access Security**

Mr Dageson states that access security shouldn't have any impact on information quality [A:41]. Although Miss Nilstun states that access security can affect the possibilities for the user to get a complete view of information and the information you have access to could imply a different meaning than those you do not have access to, creating an incomplete view [B:75]. This is amplified by Mr Dageson saying that access security often limits the information quality since the organizations do not dare to store information in a centralized way being afraid that competitors or unauthorized personal get access to it [A:41].

Access security do decrease information quality if it limits the organization to store information in the way they want to but is still something that the organizations has to consider in order to protect their information [A:43].

Our interviewees explain that access security cannot be denied but that it still can have impacts on information quality in a bad way [A:41, B:75, A:43]. To handle this problem the system should be flexible in the way that confidential information like a name could be inaccessible but the information that is of relevance and important, to retrieve a complete picture of the situation, is revealed [B:77]. Also the organization has to store the information in a centralized way and enhance the security around this centralized information core [A:41].

### **4.2.3 Developing survey questions from the Accessibility category**

We could establish that accessibility is an important dimension for information quality and that there might be a strong relation to timeliness. Our interviews suggest that problems with accessibility can be of two sources. There can be lesser accessibility because of difficulties of finding the information it is not possible to retrieve the information because of technical factors. To investigate if the BI user experience accessibility problems we constructed the following questions.

8. The information I look for in my system is always accessible.
9. The information I need is sometimes impossible to access due to technical aspects.
10. The information I need is usually hard to access due to that it is not in one place and requires me to search for it in different places.

Security around information makes the information more valuable because its value sometimes only exists because of its confidentiality. Trust can also be improved by security measures because only the right people have access to the information. Our interviews do however also suggest that access security does not necessarily have a positive impact on information quality. It is instead viewed as a barrier for retrieving information and receives a full picture, indicating a relation to completeness, as well as a barrier for structuring the information in a central location. To measure the importance of access security and if users view its impact as a negative or positive, we constructed the following survey questions:

11. The access to the information in my system is secure.
12. Due to security policies/technologies I have problems accessing the information in my system.

## **4.3 Contextual**

### **4.3.1 Relevancy**

Relevancy is described as an important dimension of information quality [B:20, A:6]. To make information relevant, a user has to be able to filter the information and the user should

be able to choose what is relevant for him or her at the moment [B: 85]. Mr Dageson has encountered a problem in the field where people tends to divide information into piles where one pile is relevant for one group and another pile is relevant for another group. This ends up in the isolation problem where the same information is represented in many places [A:49]. Instead Mr Dageson argues for the use of views, where on view is relevant for one group of users [A:49]. This is in line what Miss Nilstun defines as filtration.

The use of views and filtration removes the necessity of system programming solutions to present relevant information to the user, which is slow and costly to implement [A:49]. In order to make the filtration and use of views to work a centralized structure of information is needed [A:49].

### 4.3.2 Value Added

According to Miss Nilstun information has to be relevant, correct and updated for it to be valuable. [B:92] To add value Miss Nilstun suggests the use of inference engines, making the system able to suggest possible solutions based on available connections between data.

According to Mr Dageson value adding information is closely related to qualitative information. When the information is qualitative according the different dimensions presented it's also valuable [A:51, A:53].

### 4.3.3 Timeliness

Even though technological performance might increase the timeliness in the information, letting the information pass as few steps as possible along the way to the user also affects the timeliness [A:57]. If the information is spread throughout the organization it will take longer time to gather and interpret it [A:57]. All the information should be accessible from the same place to increase its timeliness:

*“... instead of running around reading reports or order it from elsewhere.”*

(Mr Dageson, [A:57], free translation)

Miss Nilstun describes the importance of having an organization around the information that ensures that it is updated, “someone responsible” [B:99]. Mr Dageson argues that a good structure is essential to keep the information well updated and increase the timeliness of the information. One must find techniques for the insertion of information into the system that are easy and not too time consuming yet thorough [A:55].

### 4.3.4 Completeness

According to Mr Dageson the information doesn't need to be complete, rather it has to be as complete as the situation needs it to be [A:45]. Although Miss Nilstun states that a lack of completeness might worry the user whether or not there exist information that is contradicting to what you have at hand [B:81].

*“If you don’t have the complete picture, you are of course afraid of what you are missing and if the missing part is contradicting to what you see”* (Miss Nilstun, B:81, free translation)

Mr Dageson further argues that many organizations have problems with incomplete information which leads to that the users do not trust in what they see [A:47]. He exemplifies this with the Swedish healthcare where the nurses and doctors over and over again has to ask whether or not the person is a smoker, take new blood samples etc. since they do not trust already registered information and since the information is incomplete [A:47].

The solution is according to Mr Dageson that the information needs to be dynamic so that the user might choose what to see. Different situations demands different levels of completeness in order to make the user trust in what they receive and apprehend. [A:47]

### **4.3.5 Amount of data**

The amount of data is, according to Mr Dageson, often a problem in systems today and the information is often too detailed to be useful. Many companies try to make use of system solutions designed to handle operational transactions to also support activities at a tactical and strategic level within their organisation. This approach regularly fails, because these systems lack the ability to manage information at an abstract level. Hence the data managed by the vast majority of today systems is far too detailed to support most decision makers within enterprises. [A:61, A:59]. Complex organizations may also be very productive in creating information e.g. documentation can create a large amount of data that is difficult to handle. [B:119] In order to solve problems related to the amount of data one needs to create ways to control that the user gets the information he or she needs for that particular moment and enabling the user to zoom in and out in the information looking at it in different levels of abstraction [A:59,A:61,A:63]

### **4.3.6 Developing survey questions from the Contextual category**

Our interviews established that relevancy is an important factor affected by the structure of information as well as the possibility to use views and filtration when using the information. We therefore constructed survey questions investigating the aspects of relevancy.

13. The information in my system is relevant to me.
14. I have the ability to filter information in my system.

Our interviews raised the point that a fulfilment of the other dimensions of information quality should in itself create and provide added-value. It was however suggested that the use of inference engines can further increase the value of information. To investigate this we asked if the users of BI systems get help from the technology to create value of the information.

15. My system helps me to add value to the information by showing connections and relations in it.

We found that completeness is important partly because it can affect the trust in information. Total completeness can however be viewed as an impossible task and completeness should instead be viewed as something that is important from situation to situation. To measure the dimension of completeness we constructed the following survey question:

16. The information delivered by my system is complete enough for the task at hand

Our interviews suggest a dependency between access to information and factors within timeliness. Information that is inaccessible because of its existence outside the system or due to structural, security or technical aspects can affect the possibility to retrieve the information when it is needed. Timeliness also regards the aspects of updated information where our interviews emphasize the importance of routines and an organization responsible for keeping the information updated. We therefore constructed the following questions:

17. The information in my system is up to date.

18. I receive the information I need when I need it.

19. Our organization has a person or department that is clearly responsible for information and information management.

The amount of data is in our interviews more highlighted as a threat to information quality than a positive aspect. It is suggested that very detailed information can create too much information while our interviewees also talk about the ability to drill down into information and create transparency. Because of these contradictions or the possibility that it is a difficult balancing act, we constructed questions to investigate these aspects of the amount of data dimension.

20. The information in my system is too detailed.

21. The amount of information is a problem in my system.

## ***4.4 The representational dimensions***

### **4.4.1 Interpretability**

According to Mr Dageson there are many ways to increase the interpretability [A:66]. Miss Nilstun emphasize the importance of filtering the information to make it easier to interpret the information, preventing information overload and enable different levels of abstraction in the information [B:83, 85, 89]. This is, as said earlier, aligned with what Mr Dageson calls views, which can be used to increase the interpretability of the information [A:66]. A high transparency should be upheld as well [B:89]. Another way of increasing the ability to interpret the information is to manipulate and twist the information to see different relations and outcomes [B: 71]. Miss Nilstun further acknowledges a widened problem of displaying too much information that can be too complex for the user [B:87]. A problem that according to Stefan never will be solved unless a good information structure as a base [A:68].

Overall the visualization of the information is important to increase its interpretability and this can be achieved in numerous ways [A:66]. E.g. 3D graphics can be used when large amount of data is analyzed [A:68]. Although the system should communicate to different senses in order to increase the interpretability, not just use visualization but sound as well [A:68].

#### 4.4.2 Ease of Understanding

Miss Nilstun argue that systems often are tailored for a target group, but it is not adapted enough to the different types of people. But this is not always enough, since everyone has different ways of understanding using different senses, the system should enable adaption and tailoring of the presentation of the information to different users, to a greater extent. [B: 130]

As presented during the interpretability chapter communicating to different senses and use advanced 3D graphics eases the interpretability but also the understanding of the information [A:68]. But Mr Dageson continues to argue that the depth and amount of information might also affect the understanding of it [A:68]. If the users have a good structure in creating their information it will also be easier to understand when you return to it [A:68]. Mr Dageson exemplifies with the Swedish healthcare again:

*“We heard stories about e.g. hip joint surgery where doctors give a very in-depth picture of the actual operation but forget to tell what material the screw was made of.”*  
(Mr Dageson, [A:68], free translation )

The information from this operation report might not be easy to understand since it's incomplete, but by creating a structure of what should be included in the information and a process of how to do this the information might be easier to understand when used [A:68].

#### 4.4.3 Concise Representation

It is according to Mr Dageson [C] important that information is well defined and clear and can be interpreted in a consistent way. Information today is generally speaking not concise enough to create an efficient knowledge transformation and refinement. The information is too often hard to interpret because of inconsistencies and unsustainable definitions. Examples of this can be when doctors writes operation summaries that are long, detail and extensive but the lack of a clear notation in the company can leave the summary with holes and missing pieces as well as being hard to interpret [C]. The use of coding systems has often been used to for example classify products, creating an efficient way of communication. These codes were usually developed in times of different technological capabilities and are today not dynamic and sophisticated enough to be able to adapt to change. It is important today to structure the information, either with for example codes or building blocks, to lay a foundation for seeing patterns. [C]

*“This will enable the possibilities to view much more information with a much better concise symbolism”* (Mr Dageson, [C], free translation)

Mr Dageson also mentions that there are many useful aspects of concise presentation. There is for example no reason to present more information than the situation requires. Information should be extensive enough to support a wide range of users but at the same time be able to adapt to the situation. An example of adapting the presentation of information can be a pilot who is only alerted of inconsistencies and not everything that is going as it should. [C]

#### **4.4.4 Consistent Representation**

Although one might use different views and visualizations to express different information the information should be consequent in the way that if two or three persons try to interpret the information they should interpret it in the same way [A:70].

Our interviews express the importance of using a pre-defined set of terms. A good communication requires a shared language and terminology that is represented in the system [B:127, A:39, A:70]. In order to create this pre-defined set of terms and shared language one must not create terms and notions which might change through time but rather create a basic terminology that is consistent [A:72]. Mr Dageson exemplifies this with the term customer, which has a relation to your organization as a customer but can also have another relation to you as a supplier. If you rather describe the customer as a company or organization the term would be more consistent and dynamic [A:72].

#### **4.4.5 Developing survey questions from the Representational category**

Through our interviews we established that filtering, the use of views and the ability to have different levels of abstractions could be an important part of interpretability. We also found that the ability to take an in-depth look at the information as well as manipulate it to see different angles can improve the user’s ability to interpret the information. Visualization is also important for the interpretability and according to our interviews that can be done in a number of ways. Since we already constructed a question connected to filtering we only constructed the following survey questions:

22. It is easy to interpret the information in my system.
23. My system provides me with good visualization of information.

Our interviews showed a need for adaptability in order to make the information easy to understand. We also found an importance of structure it and use defined ways of information insertion into the system in order to keep it easy to understand when used. Out of this we constructed the following survey questions:

24. The information in my system is easy to understand.

25. I can edit/change the way information is presented to me in my system.

Our interviews explained concise representation of information as a very important aspect of IQ science it can create a foundation for good and valid analysis and interpretation. To insert and construct information in the system in a concise manner was explained as an important first step. We therefore constructed two questions for our survey regarding the representation in the system and the insertion of information.

26. The information in my system is represented in a concise way?

27. The system can help me insert information in a more concise way?

The consistent representation is explained by our interviewees as the system's ability to use a shared language or common point of reference to improve the ability for users to both understand the information and be able to use and discuss with other users despite different filters, views or graphical representations. We therefore constructed the following survey questions.

28. We have a common terminology in our company; we use the same notion to describe things.

29. The information in my system is presented in a consistent way.

#### 4.5 Summary of interview analysis

Our analysis of the interviews resulted in 29 survey questions. We were able to find a number of variables that according to our interviews can affect the information quality dimensions from Strong et al. (1997). Below we present these variables and their indicated relation to the information quality dimensions. This figure further represents the basis for our survey questions. The survey questions presented in previous sections were formulated based on the information quality dimensions, the variables and the connections between them. The interviews indicated that the variables can affect more than one dimension. However there is only one question representing each variable in the survey. The following analysis of the survey will not consider the connection or relation between the dimensions or categories, as an evaluation of the framework itself is not a purpose of this thesis.

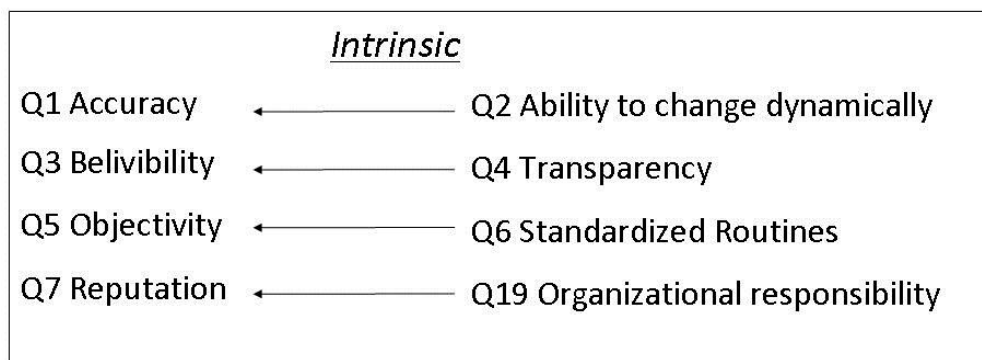


Figure 4.1 Intrinsic relations



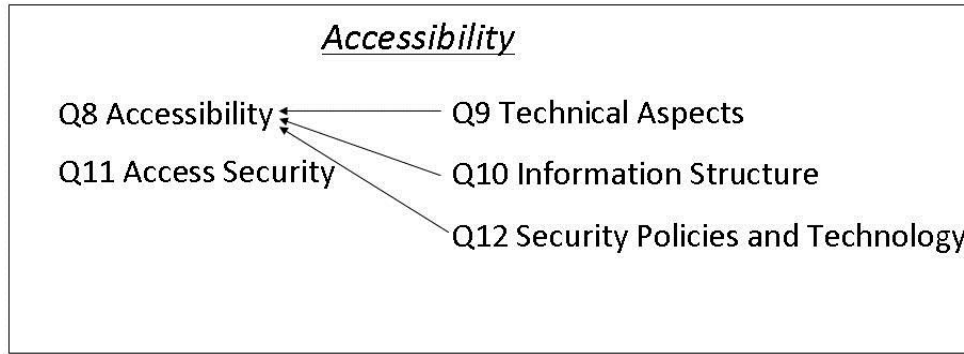


Figure 4.2 Accessibility relations

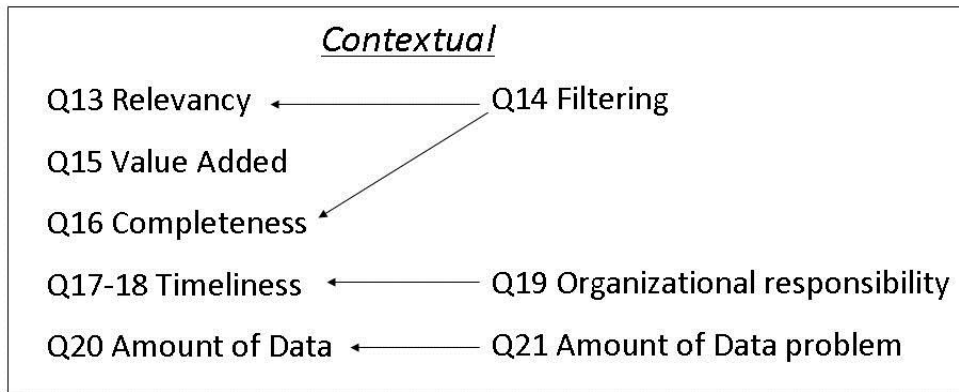


Figure 4.3 Contextual relations

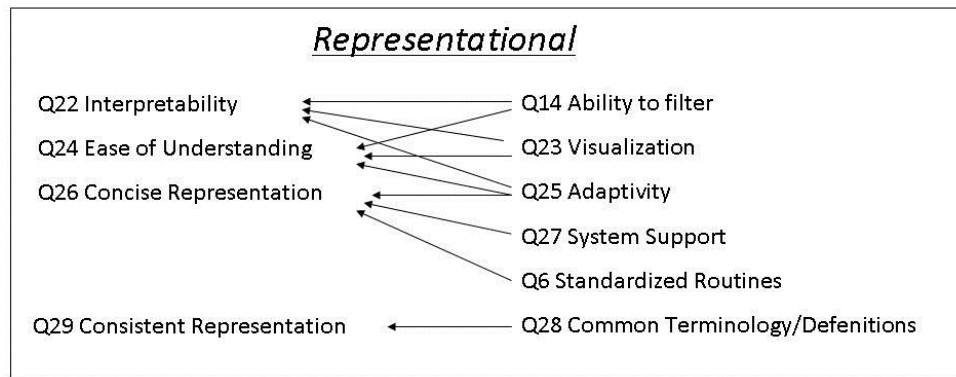


Figure 4.4 Representational relations

## 5. Survey Analysis

*This chapter presents the analysis of the survey made for this thesis. The analysis is composed of three major parts based on the four categories of the Strong et al. (1997) framework. Each category will be further analyzed out of the dimensions that were examined. Also a deeper analysis will be performed on the indications or relations that were identified and suggested in figures 4.1-4.4.*

Our online survey reached 46 respondents through our snowballing approach. Of these 46 answers we had to remove 4 answers. Three answered no or nothing at all on question number one, indicating that they are not decision makers using BI and one did not finish the entire survey. This analysis is therefore based on 42 answers. The respondents could answer: strongly disagree, disagree, tend to disagree, tend to agree, agree, strongly agree and I don't know. These answers represent the numerical scale of 0-6. We calculated the mean and standard deviation using only the answers ranging from 1-6 to remove those who answered "I do not know" which would have otherwise affected the mean. We also calculated Cronbach Alpha for the survey as ground for discussing the reliability of the survey. The survey received a Cronbach alpha of .870 (Table 5.1) which implies that the questions describe the same underlying subject. In other words this indicates that the questions have a high correlation and may be used to fulfil our purpose.

Cronbach's Alpha	N of Items
.870	29

Table 5. 1 Cronbach Alpha

### 5.1 Intrinsic

Q1	The information in my system is well corresponding with the reality.
Q2	The information in my system has the ability to change dynamically together with the reality.
Q3	I trust the information in my system.
Q4	I am able to tell from where the information that I use originates.
Q5	The information in my system is objective.
Q6	We have standardized routines for how to create information.
Q7	The information in my system has good reputation.

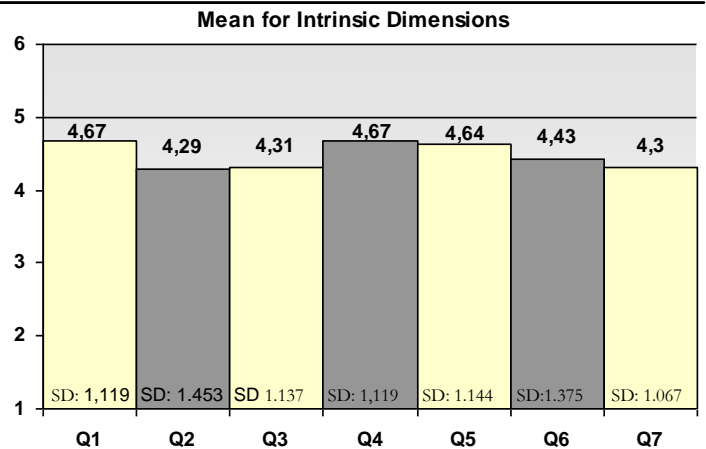


Figure 5.1 Questions, Mean and Standard Deviation for the Intrinsic category

### **5.1.1 Accuracy**

The dimension of accuracy was examined with questions 1 and 2. Responses indicate that information in the users systems tend to correspond well to the reality with a mean value of 4.67 and standard deviation of 1.119 in question 1. Question 2 which we in fig 4.1 related to accuracy received a mean value of 4.29 indicated that the information tend have the ability to change dynamically with reality. Question 2 did however have an even higher standard deviation of 1.453, indicating that system's ability to cope with change can vary a lot.

### **5.1.2 Believability**

Believability was represented in the survey by questions 3 and 4. Question 3 had a mean of 4.31 and SD of 1.137, whereas question 4 scored a mean of 4.67 and a SD of 1.119. The values indicate that there is a fairly high level of believability in the system and the respondents tend to trust in the information and be able to see its origin. Hence, initially the results of these questions indicate a high believability in the respondent's information.

### **5.1.3 Objectivity**

Questions 5 and 6 in the survey examined objectivity. Both questions on objectivity scored high mean values (4.64 and 4.43) and the standard deviations of 1.144 and 1.375. Hence, respondents tend to agree that the information in their systems is objective and that they tend to have standardized routines for the creation of information. However, the higher standard deviation in question 6 indicates that the establishment of standardized routines varies among the respondents.

### **5.1.4. Reputation**

The dimension of reputation was examined with question 7, which had a mean value of 4.30 and a SD of 1.067. The analysis shows that respondents usually consider information in the system to have a good reputation. One variable that was addressed as a possible way of improving the reputation was the use of organisational responsibilities. The regression between this variable and reputation is discussed in the next section together with three other relations between variables and dimensions.

### 5.1.5 Relation analysis

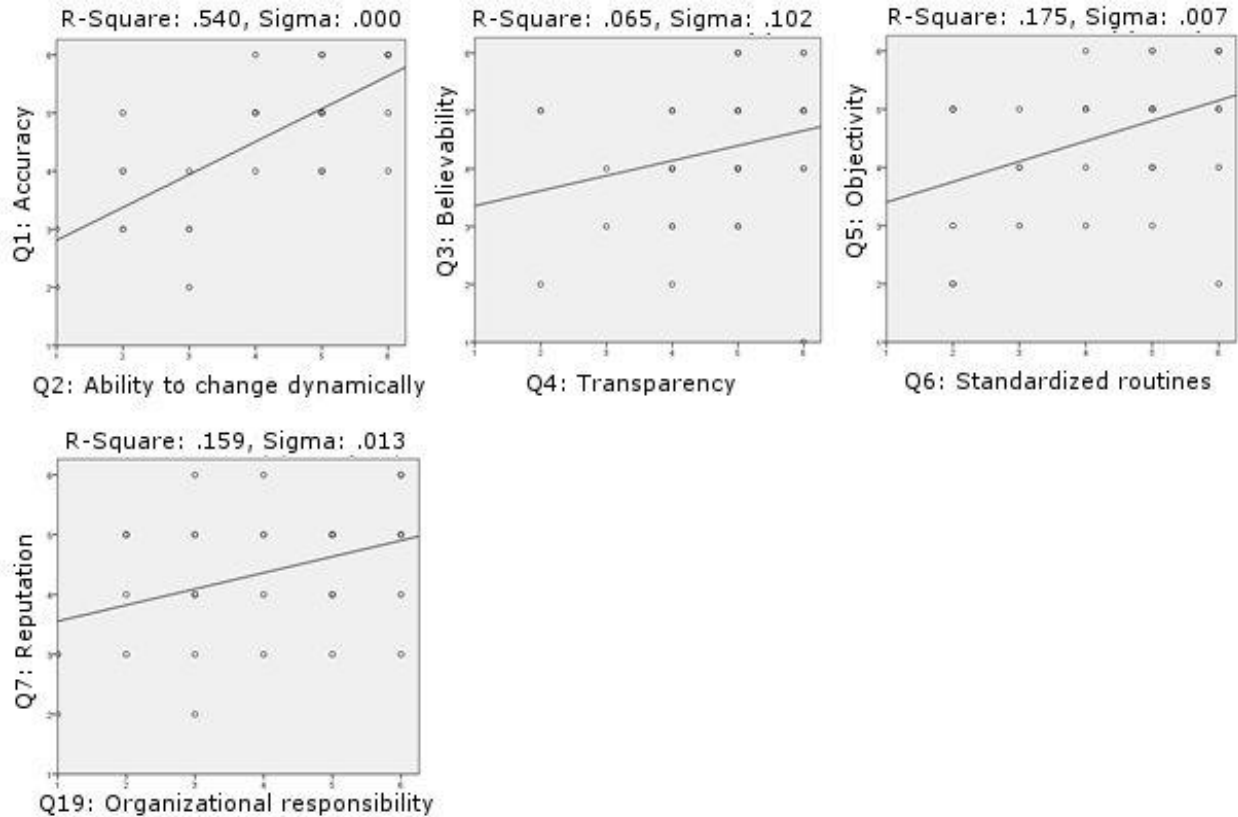


Figure 5.2 Regression analysis for Intrinsic category

In fig 5.2 four possible relations between dimensions inside the intrinsic category and findings from our interviews about how these dimensions may be realized. The first relation is between accuracy of the information and how well the system is able to change dynamically together with the reality (see fig. 5.2). In this relationship we found a strong positive relation indicating that when the system has the ability to change dynamically the accuracy of the information also increases. The  $R^2$  value of 54% indicates that the regression in graph A (fig 5.2) quite well explains the variation in the answers from our respondents. The low sigma indicates a significant relationship among accuracy and the system's ability to change dynamically together with the reality.

The second relationship in the intrinsic category among believability and transparency is slightly positive. The very low  $R^2$  (6.5%) indicates a weak explanation of the variation in the answers and also the relatively high sigma of .102 indicates a fairly low relationship among the transparency and its effect on the believability in the information.

The relationship between objectivity in the information and whether or not the organization has standardized routines for creating information has positive regression with a coefficient somewhere in between the two first relationships. Also in this graph the  $R^2$  value of 17.5% is low. The sigma is also slightly high and you cannot therefore really state a relationship among standardized routines and its effect on objective information.

The fourth and last regression analysis made in the intrinsic category is describing the relationship between the information's reputation and if the organizations has a person or department that is clearly responsible for information and information management. The graph indicates a slightly positive relationship although the values are overall weak. Both the  $R^2$  of 15.9% and the sigma of .013 are not sufficient to prove a strong and significant relationship between the two variables.

## 5.2 Accessibility

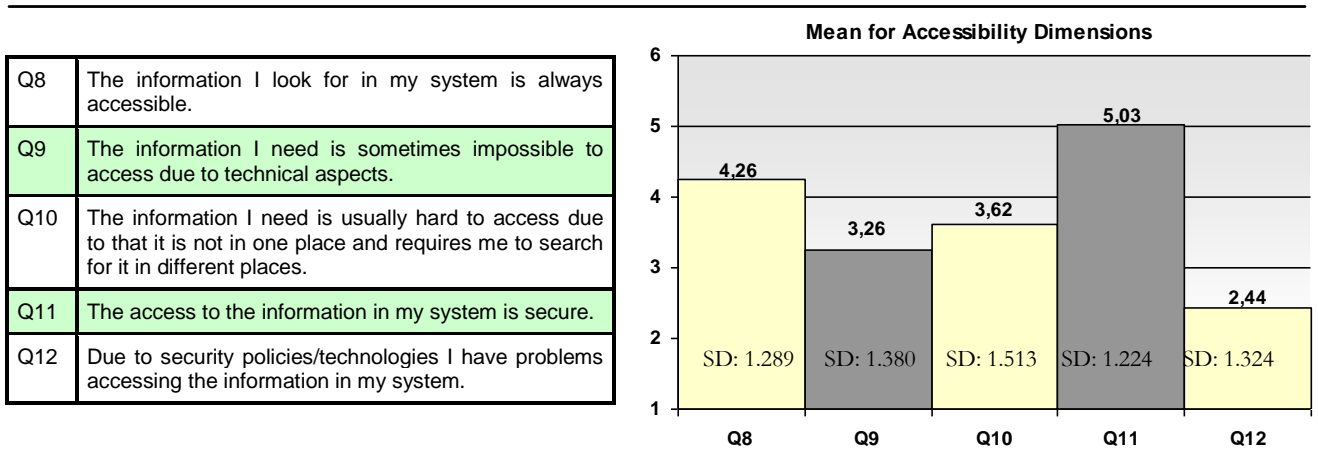


Figure 5.3 Questions, Mean and Standard Deviation for the Accessibility category

### 5.2.1 Accessibility

The dimension of accessibility is examined by questions 8, 9 and 10. Results of question 8 indicate that there is a fairly high accessibility in the systems with a mean of 4.26 and standard deviation of 1.289. The mean values in questions 9 and 10 indicate that there exist tendencies towards problems with accessibility aspects. The standard deviations also indicate a large variation from system to system of how technical aspects and information structure affect the accessibility.

### 5.2.2 Access Security

The questions 11 and 12 examined access security. Question 11 obtained a high mean value of 5.03 with a SD of 1.224 which strongly indicates that the respondents agree upon that their information is secure. Question 12 resulted in a low mean of 2.44 and despite a relatively high SD our respondents tend to disagree whether security policies and technology would cause problems when accessing information in my system.

### 5.2.3 Relation analysis

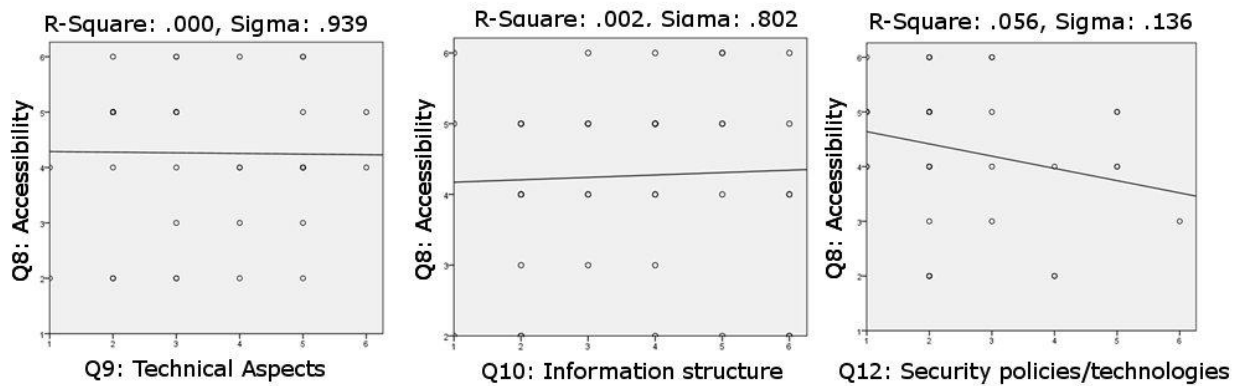


Figure 5.4 Regression analysis of the Accessibility category

In the second category of dimensions from Strong et al.'s (1997) framework we have extracted three relations with other variables. First; do there exist any technology aspects that prevents access to the information and second; is there any structural problems that hinders the access to information and making them have to look for information in various places, and finally; is there any security policies that limits the accessibility to the information in the system. As we can see none of the graphs indicates a strong positive or negative relationship, although security policies effect on accessibility seems to have a slightly higher coefficient then the other relationships.

There seems to be no relationship at all between accessibility and technical aspects with a coefficient seemingly close to zero, a  $R^2$  of 0% and sigma close to 1. Neither information structure seems to have any effect on accessibility with the  $R^2$  and sigma values being almost as bad as in the previous case. As stated above, security policies seems to have a somewhat stronger relationship then the two previous cases. Although even in this case the  $R^2$  of 5.6% and sigma of .136 is not acceptable to indicate a strong relationship.

## 5.3 Contextual

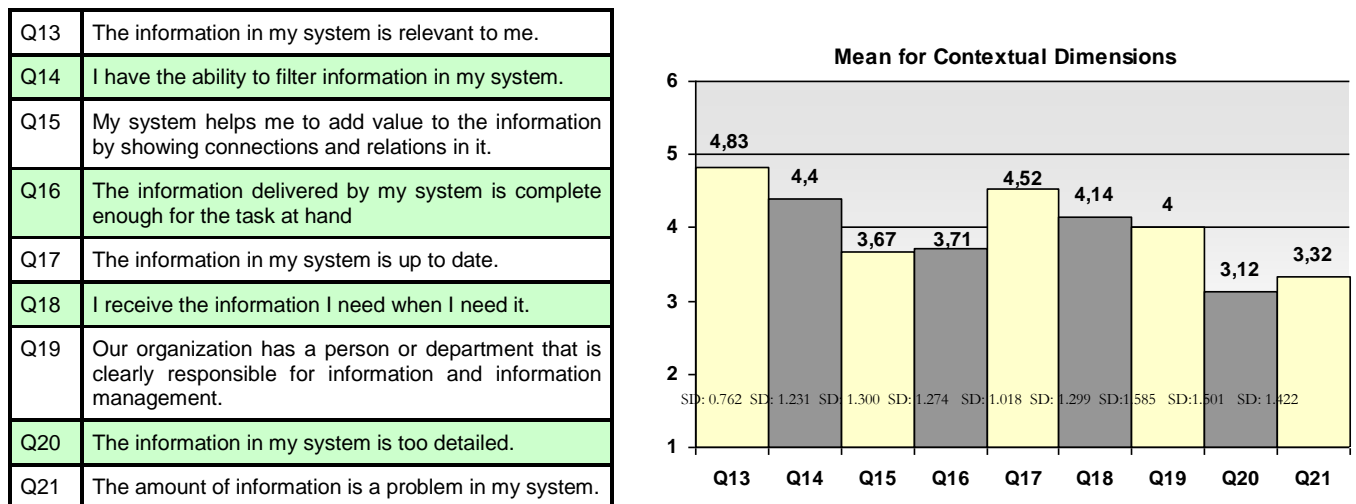


Figure 5.5 Questions, Mean and Standard Deviation for Contextual category

### 5.3.1 Relevancy

The dimension of relevancy was examined with question 13 and 14. Question 13 obtained a mean of 4.83 and a SD of 0.762 which indicate a centralized view among the respondents whom seem to agree that the information in their systems is relevant. The respondents also indicate that they have the ability to filter the information in their systems (Q14).

### 5.3.2 Value-Added

Question 15 was used to address the dimension of Value-Added. It had a mean of 3.67 and a SD of 1.300 which indicate a fairly small presence of the systems ability to add value with however a fairly large spread among the answers.

### 5.3.3 Completeness

The dimension of completeness was addressed by question 16, which resulted in a mean value of 3.71 and a SD of 1.274. The deviation in the results shows some disagreement among the respondents who both tend to agree and disagree to if the information in their system is complete.

### 5.3.4 Timeliness

This dimension was connected to questions 17, 18 and 19. The result of question 17 indicates that the information in the respondents systems is up to date with a mean of 4.52 and a SD of 1.018. Both question 18 and 19 have a mean around 4 and fairly high standard deviations. This deviation imply that the average respondent tend to agree to the fact that they have an organisation around the information taking responsibility of it and receive the information when they need it.

### 5.3.5 Amount of Data

Question 20 and 21 are inconsistent with a SD above 1.4, showing that there is differentiating views and spread among the respondents. The respondents therefore tend to disagree rather than agree whether the information in their system is too detailed and that the amount of information is a problem because of their means around 3.

### 5.3.6 Relation Analysis

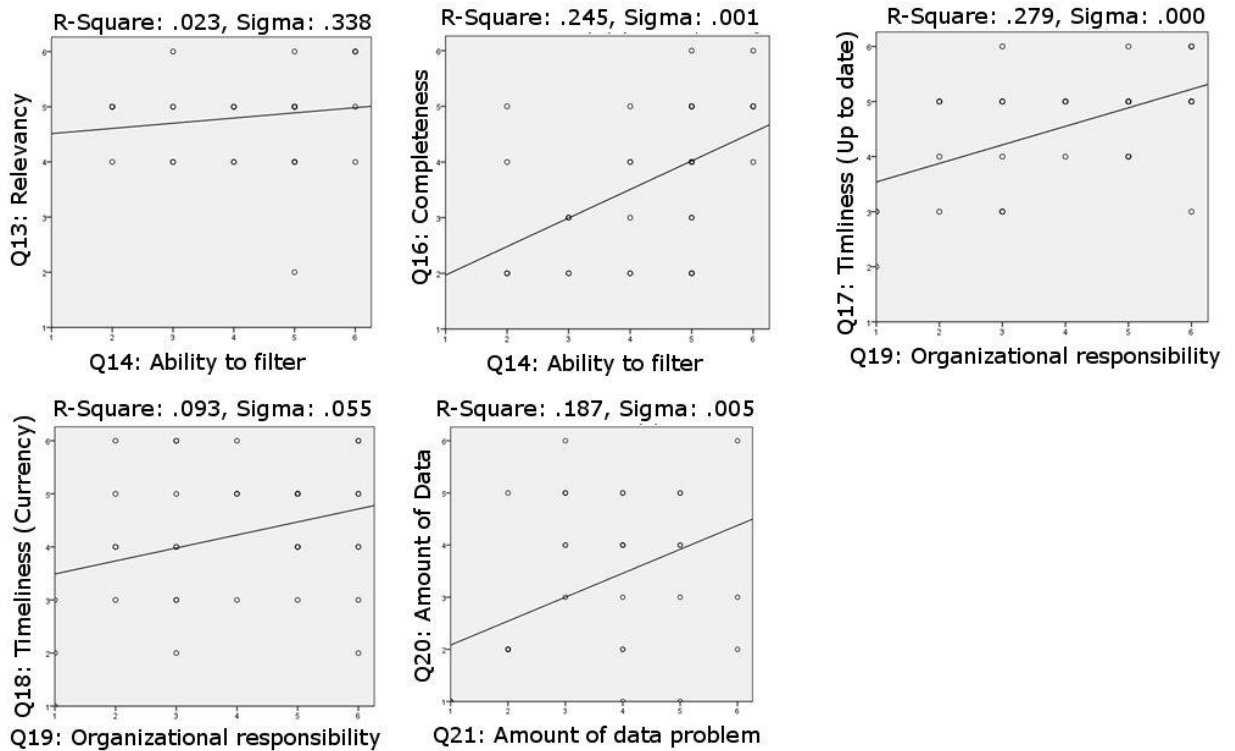


Figure 5.6 Regression analysis of the Contextual category

The five graphs of relations in the contextual category shown in fig 5.6 all indicate positive relationships between the variables and the dimensions. In common for all five relationships are quite low R<sup>2</sup> values even if they vary a lot, whereas the significance in most cases is good.



The first dimension examined in the contextual category was relevancy. The result of the interviews indicated a relationship between relevancy and the ability to filter information. The graph showed a slightly positive relationship; however the low  $R^2$  value of 2.3% and a very poor sigma value of .338 indicate that one do not need to have an ability to filter the information in order to make it relevant.

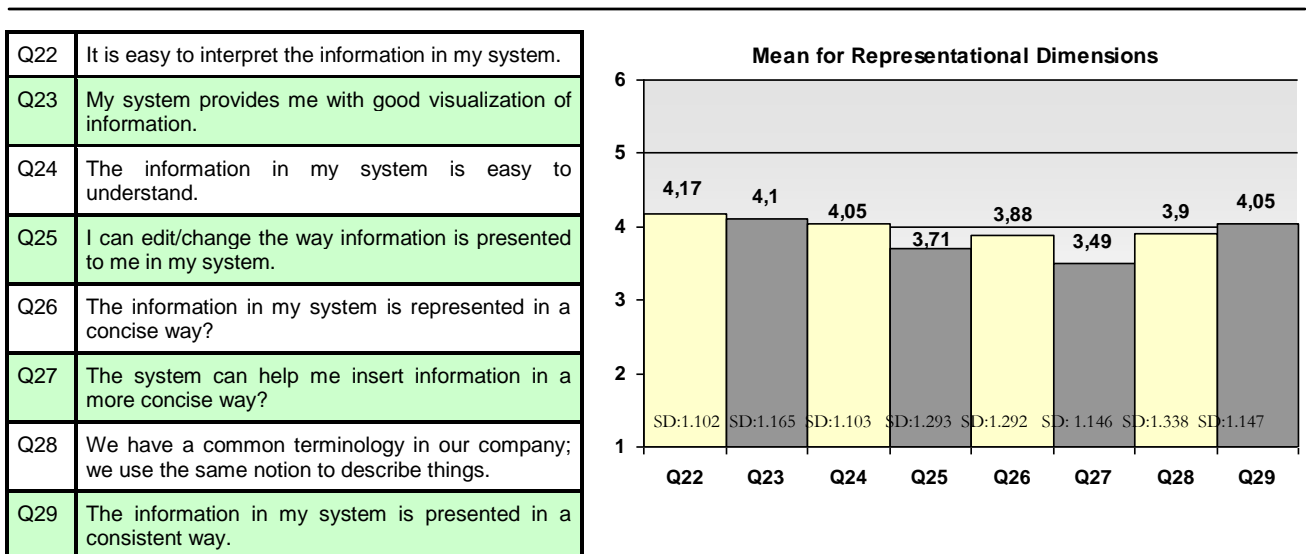
The second relation tested was between completeness and the ability to filter information. The graph shows a strong positive relationship with a good significance of .001, indicating that the ability to filter information has a positive effect on the completeness of the information. However, the  $R^2$  is quite low and 24.5% do not provide a very good explanation of the variance.

The analysis indicates that organizational responsibility had a positive effect on how well updated the information was, which is one aspect of the timeliness dimension. A sigma value of less than .000 shows that the relationship is highly significant. However, again the fairly low  $R^2$  of .279 indicate that the variation is not very well explained.

Organizational responsibility was also indicated to have an effect on timeliness, in this case the currency aspect. Even if the graph show a positive curve, the poor values of  $R^2$  9.3% and sigma .055 indicate that the variance is not well explained, neither is the result very significant. Hence the relationship we found between the currency of the information and organizational responsibility is not very strong.

Finally for the contextual category the findings in the interviews indicated that there is a relation between too detailed information and problems with the amount of information. There is a quite strong positive relationship and the sigma value of .005 shows that it the relationship is fairly significant. However, a low  $R^2$  of 18.7% again show a poor explanation of the variance.

## 5.4 Representational



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Figure 5.7 Questions, Mean and Standard Deviation for the Representational category

### 5.4.1 Interpretability

This dimension was examined with questions 22 and 23. The mean around 4 and SD around 1 indicate that the users systems tend to represent information in a way that is easy to interpret and has good visualization.

### 5.4.2 Ease of Understanding

The views of Ease of Understanding were obtained through question 24 and 25. Question 24 received a mean of 4.1 with a SD 1.165 implying that the respondents tend to agree that the information in their system is easy to understand. Question 25 received a lower mean, 3.71, and higher standard deviation, 1.293. The adaption of how the information is presented might therefore be limited.

### 5.4.3 Concise Representation

Question 26 and 27 addressed concise representation. Question 26 had a mean of 3.88 and a SD of 1.292 while question 27 obtained 3.49 respectively 1.146. The wide spread of the answers and a mean close to middle of the scale create limitations and does only indicate that information is usually not represented in a concise manner. It also indicates that the average respondents can either get help from the system to insert information in a concise way or not receive such help.

### 5.4.4 Consistent Representation

Question 28 and 29 with means of 3.9 and 4.05 present the presence of a common terminology in a company and that the information in the respondents system is presented in a consistent way. The SD of 1.338 and 1.147 does however indicate large variations especially in question 28. The common terminology is therefore sometimes not as common in many organizations which might affect the consistency of the representation. This relation will be analysed in the next section.

### 5.4.5 Relation analysis

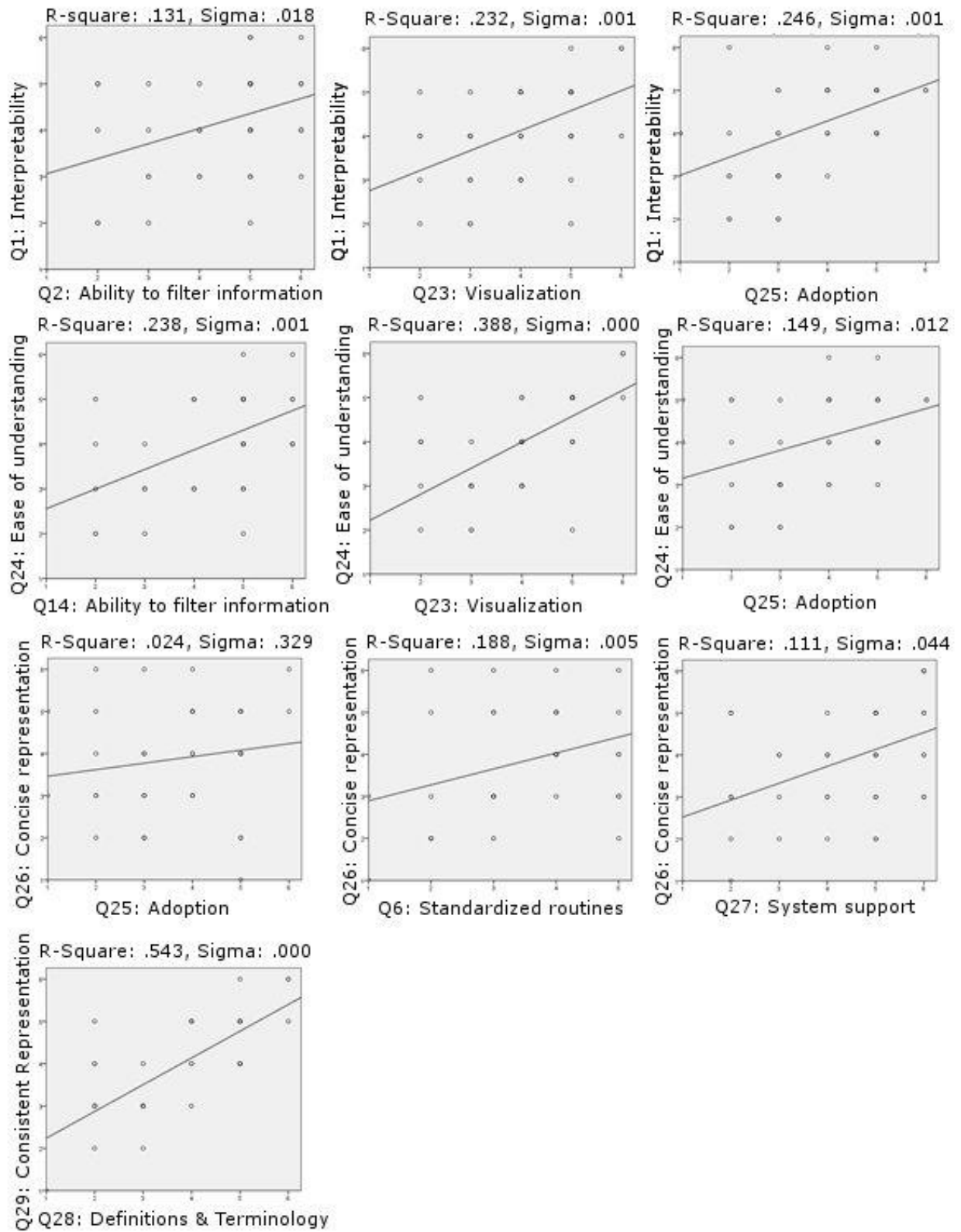


Figure 5.8 Regression analysis of the Representational category

The representational category contained as many as ten possible relations extracted from our interviews. All of the graphs in fig. 5.8 indicate positive relationships between the dimensions and factors examined, although some have a slightly higher coefficient than others. Overall the  $R^2$  were quite low but with some exceptions and the sigma values varying from good to bad.

The interpretability of the information seemed not be that related to the user's ability to filter his or hers information, with an  $R^2$  of 13.1% and sigma of .018 the variation is quite bad explained and the relationship is not that significant. However interpretability had a more significant positive relationship with visualisation and adaption both having an acceptable sigma value of .001, although the  $R^2$  was close to 25% which can be argued to be a bit low.

Ease of understanding had varying results in its relation towards the ability to filter information, visualization and adoption. The ability to filter information had a good significance of .001 but an  $R^2$  of 24%. Visualization had a strong positive relation with very good significance (.000) and relatively high  $R^2$  of almost 40%. However, adoption had both low  $R^2$  (15%) and high significance indicating a poor regression and impact on the ease of understanding the information.

None of the three factors adoption, standardized routines or system support which our interviews indicated to have an effect on the conciseness of the information. Even though they all indicated a positive relationship none of the regressions exceeded an  $R^2$  value of 20%. However, standardized routines seemed to have a little bit more significance than adoption and system support, although still  $>.001$  which is not great.

The last dimension included in a relation in this category is the consistent representation of information and how this was affected by a common definitions and terminology in the organization. The relationship among these two variables was indicated to be strong according to our findings.  $R^2$  had a value of 54% and the sigma was close to zero (.000). The common definitions and terminology therefore had a great impact on how consistent the representation of the information was in the different systems.

## **5.5 Summary of survey analysis**

The questions in our survey were formulated to either ask about a dimension or a variable connected to one or more dimensions as showed in figures 4.1-4.4. The mean for these questions does of course vary but range from 3.49 to 5.03 (excluding the negated questions described below) where 19 questions had a mean between 4.0-4.9 and only one scored above 5. Most questions therefore received a mean corresponding to the: *I tend to agree* answer in our survey.

Five questions (Q9, Q10, Q12, Q20, and Q21) were formulated based on potential problems to see if the users agreed or disagreed that such a problem exists in their system. The mean of these questions ranged from 2.44-3.62 which indicate that technical aspects, information structure, security policies and too detailed information are not imminent problems for the average BI user in our sample. The same questions did however receive some of the highest

standard deviations 1.324-1.513 of all questions which in turn indicate high inconsistencies in the answers and that some respondents tend to agree that such problems exist.

As illustrated through figures 4.1-4.4 we looked closer at 21 relations through regression analysis. In this regression analysis we have 10 regression lines with a sigma below .005 hence above 95% significant and only two of these had an R-square above .50. We must therefore consider that most of those regression lines that indicate a relation between the dimension and the variable might not provide an accurate and reliable relation.

## 6. Discussion

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*We have throughout this thesis presented literature, interview findings and survey findings. This chapter presents a discussion of these findings linked to the four categories of information quality, followed by a general discussion. We will try to connect these findings into a discussion of how information quality is realized in Business Intelligence Systems.*

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### 6.1 The intrinsic category

The intrinsic category refers to the mismatch among data. The category consists of accuracy, believability, objectivity and reputation. In chapter two we presented the concepts in BI named getting data in and getting data out. We place the intrinsic category close to the concept of getting data in, since it is concerned with dimensions describing embedded aspects of information per say and not with its presentation.

Accuracy is described as the extent to which the information is “free of error” (table 2.9) and has been mentioned as a crucial part of information quality in both our literature review and interviews. We also got strong indications that the information in our respondents systems is accurate and correspond well to reality by looking at the mean values for these questions. We also argue that one way to improve accuracy and realize this dimension is through the system’s ability to change dynamically with reality because of our support of this relation in the interviews as well as in our regression with a very high significance and good  $R^2$  value.

Objectivity, which refers to the extent data is free of bias, is operationalized by the reviewed literature and our interviewees focusing on the process of inserting information. Both literature (section 2.5 – establishing information quality) and our interview findings present the importance of standardized routines for information insertion to gain objectivity. We were also able to indicate that our survey respondents could handle objectivity by using standardized routines, presenting a weak but positive relationship. Standardized routines might have some effect on objectivity although our survey results were too weak in order to give a sufficient and truthful picture of the relation.

The literature highlights the effect objectivity and accuracy can have on believability of information which in turn affects the reputation of the information (Figure 2.1). Poor believability and reputation was at the core of our initial problem area and is described as common problems in our interviews. Believability received a relatively good mean value in our survey and can therefore be argued to be fairly well realized in business intelligence systems according to our findings. Also the reputation of the information seemed to be high with a good mean value and a relatively low standard deviation. For both believability and reputation we found possible variables that can affect these dimensions. We could however not find a very strong relation between the transparency and believability or organizational responsibilities and reputation but still a relation existed. Sections 2.4 and 2.5 do however

explicitly address the importance of the user's ability to understand the connections between information and to have an organization around the information to improve different aspects of the information. This thesis can only indicate a small support for these statements and certainly not reject them.

As mentioned above, the literature review describes strong relations between the dimensions within the intrinsic dimension and so does our interview findings. We argue that the relatively high means in the intrinsic category indicate that the dimensions within it are well realized even when considering the deviations in the answers. We also argue that improvements in the intrinsic category can be made by working with the system's ability to change dynamically and having standardized routines because of the alignment of the literature with the findings in the survey and in the interview. However the variables transparency and organizational responsibilities were something the interviews highlighted as important but ambiguous results were produced by our survey. Hence no actual conclusions about these relationships can be made and there might exist other reasons or relations that make these variables important which we haven't explored.

## **6.2 Accessibility**

The two dimensions that the literature embodied in the accessibility category were accessibility itself and access security. The accessibility category is more aligned with the getting data in aspect of BI than the getting data out aspect since it is concerned with the infrastructure and source of information and making the information accessible rather than how it is presented and its timeliness.

Our interviews were much aligned with how the literature explained the accessibility dimensions and the problems in this category. They both stated that there was a problem with accessibility being poor because of technical aspects (see fig. 2.2) and that access security could decrease the quality because of policies and technologies which hindered the user from accessing the information. However our interviews also highlighted another problem with accessibility being that the information might not be accessible because of the structure of the information or that it is spread out in the organization which makes it less accessible.

When we created our survey we were interested in all of these aspects. The answers we got varied in their results. It seemed that most respondents actually thought that the information was always accessible with a decent mean value. An interesting observation can be made when looking at Q9 (whether or not the information is impossible to access due to technical aspects) and Q10 (hard to access due to that the information is not in one place and acquires the user to search for it). These two questions contradictory received quite high mean values as well. This is further explored in the regression analysis where we found practically no relationship at all between accessibility and these two variables. One might think that if the respondents have voted high for system accessibility they would vote low for the two following questions about implications to accessibility and create a strong linear relationship, but this was not the case. One possible explanation for this is that people tend to think that the information is always accessible and therefore vote high, but when they are confronted with a questions about technology limitations preventing accessibility or that the information

is stored in various locations they realize that these problems actually do exist. The same explanation could be given to the security policies problem and the lack of a good relation in this case.

The two survey questions (Q9 and Q11) about the dimensions from the literature received a result that indicated a good realization of the accessibility category. Security policies seemed not to be a problem and the information overall were indicated to be secure. This further indicates a high information quality, since we in chapter two stated that integrity is a central part of it. Nevertheless we cannot neglect the contradicting findings from the regression analysis indicating a possible problem with spread out information resources and technical problems. It is therefore hard to conclude how this category is realized. In one sense it received good results. However, there are some internal contradictions which might exist because it seems to be better realized than it really is.

### **6.3 Contextual**

The contextual category incorporates the dimensions of relevancy, value-added, completeness and amount of data. The category is about making information useful for the user. With regards to the BI concepts of getting data in or out, the contextual category is more aligned with getting data out, providing the user with the right version and the right amount of relevant of information for the task at hand.

The importance of relevancy in information was expressed in the literature as to which extent it is suiting for the task at hand and it is also shown that relevancy is affected by completeness. In relation to this, our interviews proposed that filtering abilities could be a good way to achieve relevancy and that it is important that the user can decide which information that is relevant at the moment. The addition proposed in the interviews regarding filtering was also examined in the survey along with relevancy. The survey later showed that relevancy got pretty high ratings by the users but the analysis of the relation between relevancy and filtering abilities was however inconclusive. A weak relation was found, but the very poor test results was not very convincing. This shows some discrepancy between the literature and the interviews regarding relevancy. Our results show that relevancy and filtering individually both tend to be realized but the proposed relation that filtering would support relevancy had no bearing.

The dimension value-added was according to the literature about the benefits and advantages that comes from making use of the information. The interviews rather refer to value-adding as a result of high qualitative data and fulfilment of other dimensions. This is also quite aligned with what the literature presents in e.g. fig. 2.1 and 2.3, where the utilization of other quality dimensions seems to determine the added value. The survey question regarding value-added was formulated to investigate the systems inference abilities and showed a quite low rating, showing that respondents almost tend to agree that their system provide the add value by showing connections and patterns in the information. Also a quite large difference between different systems was shown with a quite high standard deviation. The survey analysis didn't provide any deeper understanding regarding this dimension, more than that users barely tend to be satisfied with the value-adding of the



systems. Still, a match was found between the views of interviewees and the literature regarding value-adding and that it is affected by fulfilments of other quality aspects.

Timeliness was introduced in the literature review as the importance of information being up to date and delivered on time. The importance of up to date information was also emphasized in the interviews, where the timeliness was important for the information structure but also strongly affected by organisational responsibilities. Timeliness independently also got relatively good ratings in the survey, where users felt that their information is up to date and that they get it on time. It was also shown that organizational responsibilities tend to be established, but the large variance indicates that the extent of organizational responsibilities differs among the systems. The analysis of the relations between timeliness and organizational responsibilities showed that there is some relation between established organizational responsibilities and whether information is good in the sense of being up to date. However the connection between organizational responsibility and currency wasn't very strong. The literature and interviews were quite aligned in their take on timeliness; however the interviews also highlighted the importance of organizational responsibilities. Together with the quite good results in the survey, timeliness is shown to be important and something that many users acknowledge. Also, this quality dimension can possibly be improved with the establishment of organizational responsibilities.

According to the literature completeness is about making sure that information isn't missing anything and is sufficient for the task at hand. Also problems with data producers failing to supply complete information are highlighted. The interviews were quite unanimous in defining completeness as information that is as complete as the situation requires, but it was also suggested that filtering abilities could improve the completeness for each situation. This relationship was examined in the survey and also gained support in the analysis of the survey, where a positive relation was found, although it did have a bit low  $R^2$  value. We argue that there is a relationship between completeness and ability to filter, and that it could be a way of working with completeness based on the concurrency of literature, interviews and survey. Also, the mean value of completeness in the survey showed that respondents barely tend to agree with that the information is as complete as necessary, which indicate that there is a lack of completeness in the systems, since "tend to be complete" isn't a very high rating.

Another contextual problem area expressed in the literature is the amount of data. The literature states that a too large amount of data can slow down the processing and that the amount should be appropriate for each task. The interviews also recognize similar problems of data with too detailed information which makes it hard to make use of and also problems with too vast amounts of data that are hard to handle. In the analysis of our survey we found that amount of data is neither good nor bad and the results also show a great variance among the responses. A reason for this could be the fact that the problem of too detailed or too much data vary a lot depending on the system. We also examined the possible relation that if there is a problem of too much information it would also be perceived as too detailed. However we found little support for this relation. Even if a relationship was found, the results weren't strong enough to draw any conclusions. We did provide some findings for this dimension since the literature and the findings in the interviews were aligned, showing that the amount of data can affect the quality. However, the survey findings were quite fruitless showing that users were somewhere in between tending to having problems with amount of data and not having a problem with it.

The literature shows that the dimensions within the contextual dimension are related and often affect each other. This is also something that is found in the interviews, where dimensions e.g. value-added are affected by other dimensions and aspects. The contextual dimensions are quite varying in terms of realization. We argue that dimensions such as relevancy and timeliness with fairly good means tend to be realized. We also argue that organization responsibilities have a good effect on timeliness and can be a way of realizing this. The interviews also proposed that the ability to filter would affect some of the dimensions, which alone is a finding. However the survey didn't show any strong evidence of this affect, though some support for the effect on completeness was found. It could however be that there are other positive effects of the filtering that we just didn't find. The contextual category also had some results that were quite bad and some that gave an inconclusive picture. E.g. amount of data was not very high rated in the survey, hence not as well realized. An important aspect is also that there was a large spread or discrepancy among respondents, further indicating that the realizations of information quality in the contextual category vary a lot depending on the system. Finally we argue that we found realizations of some of the dimensions in the contextual category and also for some of the variables proposed in the interviews. However there were also some weak results within the category which ends up in a torn or split view of this category

## **6.4 The representational category**

The representational category concerns how information is represented and understood in the system. This category is composed of the dimensions interpretability, ease of understanding, concise representation and also consistent representation. One could argue that this is a more intangible category where there are numerous aspects of getting the information out in a usable way. Another aspect of the representational category addressed in the interviews and in chapter two is not just the usefulness of the information but also the production of the information and the representation of the information inside the system. Some variables have been highlighted as important in the production phase to allow an interpretable and understandable use of the information in a concise and consistent way. This creates a complex conceptual foundation within the representational category where both production and use of information are included. However we still argue that the representational category is a getting data in aspect if we relate it to BI, since its overall purpose is how information is represented.

The literature defined interpretability as the extent to which the information was in appropriate languages, symbols and units, and that the definitions were clear. Our interviews however gave a more in-depth picture of how to operationalize interpretability in BI systems by invoking the ability to filter, visualization and the system's ability to adapt to the users need. In our survey the interpretability dimension received a fairly high mean value and a low standard deviation, although not one of the highest compared to dimensions in other categories. Also the relationships towards the above stated variables were indicated to have a positive relationship, although the relationship between the ability to filter the information effect on interpretability received arguable results. However, visualization and adaption was indicated to have a positive effect on interpretability.

Ease of understanding was in our interviews much aligned with the interpretability dimensions. The interviewees highlighted the same variables affecting the ease of understanding as those affecting interpretability and they presented a relation between the two dimensions. In the same manner also the literature aligned interpretability with ease of understanding. As with interpretability, ease of understanding received quite good results in our survey although its mean was a bit lower. The relations indicated a significant positive relation towards the ability to filter, visualization and adaptability, although the adaptability regression received somewhat questionable results.

The extent to which information is compactly represented is in the literature labelled as concise representation. Both the literature and our interviews proposed conciseness not only to be something concerned with the presentation aspect of BI systems but also something concerned with the inside of the BI systems. Our interviews highlight the importance of concise information creation as a foundation for concise presentation of information. The same importance is highlighted in the literature where they state that conciseness in the information source is of importance if a concise representation should be achieved. Our survey tried to invoke this perspective by relating concise presentation with if the respondent's organization had standardized routines for insertion of information and if the system could help the user to insert information in a concise way. Although showing positive relations among the variables and dimensions the results were quite arguable. The only relation that showed a significant relationship was the organization having standardized routines for creation of information and concise presentation. Concise representation had a low mean value that was below four and we therefore argue for other ways of realizing this dimension in BI systems and increase the standardized routines for inserting information.

A dimension that in the literature was much aligned with concise representation is the consistent representation. Consistent representation was in the literature defined as the extent to which information is presented in the same format. The same connection was provided in our interviews, aligning consistent with concise representation by stating the importance of using a set of predefined terms and common terminology. They also highlighted the concept of presenting information in the same format but extended it to saying that it could be presented in different ways but the importance lay in that the user should interpret the different presentations in the same way. In our survey consistent representation received an acceptable mean value and standard deviation. Also its relationship towards the common definitions and terminology in the organization showed a strong, significant and positive relationship. We therefore argue that the BI systems have acceptable consistent representation of information and that this can be further realized through a common terminology and set of definitions in the organization.

Overall the dimensions of the representational category received lower mean values than other dimensions in our survey, indicating a poor realization. Nevertheless we above presented some interesting relationships and indications towards how to increase the information quality within the representational category. However the variables found in this category received overall low mean values which also indicates a possible need for improvements.

## 6.5 Discussion summary

We have through our literature review presented (section 2.1) the view of BI systems as the process of getting the data in and getting the data out. Our interviews highlighted the same perspective as important in information quality where often the “getting data in” perspective is forgotten and we have therefore included this perspective in our discussion. We have through our interviews for example learned that one can possibly improve the system’s ability to insert and contain qualitative information by working with a sound organizational foundation where you reflect upon information in similar terms and use different types of structures to encourage and improve this foundation. However we couldn’t find any support for any of the two perspectives being more or less realized than the other.

Furthermore the interviews overall corresponded well with how the reviewed literature explained information quality out of the categories and dimensions in our framework. The interviews often enhanced the dimensions and developed them further. This was mostly done by presenting variables that affected the dimensions. The survey found varying support for these relationships; some did indicate a strong relationship where others got ambiguous results. Some of the problems raised by our interviews were also highlighted by our respondents in the survey.

If we look at the findings dimension by dimension most of the mean values are close to 3 and 4. Only occasionally do they touch or exceed 5. This need to be mentioned since in our survey the value of 4 states that the respondents *tend* to agree. E.g. the mean value for the dimension of completeness was 3.71 which indicate that the respondents in general tend to agree or tend to disagree. These are quite interesting results since what they are actually saying is that our respondents tend to agree or even tend to disagree about whether the information in their system is complete or not. The same thing can be seen with the dimension of trust, which is quite a problem since this is information they are ought to make decisions upon. The same reflection can be made with many of our dimensions. This is important to notice since at first glance one might look upon the results and state that information quality is well realized but when you think about it might not actually be so according to our findings. We also highlight the risk of further scenarios such as with the accessibility relations, where we could find possible indications to that the respondents actually believe they have better accessibility than they truly have.

As stated, our interviews did recognize this problem with possibly low information quality and so did the literature. The interviews however had some practical advice that should increase the information quality and enhance these dimensions. But as stated not all of them could be indicated to have a strong relationship among our respondents. Although many of these variables from our interviews received mean values that indicated some sort of realization we couldn’t find the relation in which they were supposed to participate. The reason behind this we may only reflect upon. Four possible reasons we can find are; the variables are important and affect information quality in another context which our framework doesn’t support or cover; the variables are only thought of having an effect on information quality; the variables themselves are dimensions of information quality; the variables affect dimensions which we haven’t tested.

## 7 Conclusion

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*To summarize our thesis we highlight our general conclusions in relation to our research question and purpose. We also present our views on how our thesis can be used for future research as well as the limitations in our work to further highlight some important aspects of our findings.*

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### 7.1 General conclusions

The purpose with this thesis was to give an indication about how information quality has been realized in BI systems by answering the question: *How is information quality realized in Business Intelligence systems?* Our analysis of literature, interviews and surveys led us to these conclusions and lessons.

In our discussion we used the concept of getting “data in” and getting “data out”. We want to initiate our conclusions by highlighting this overall and more general finding which indicates the necessity of working with the categories, dimensions and variables of how to get data in to be able to get data out in a useful and usable form.

Information quality according to the framework we used was highlighted as a problem in our interviews. Our interview analysis expanded the views of the literature by identifying 13 variables that could support these information quality dimensions:

**Table 7. 1 Identified variables**

System's ability to change dynamically
Transparency
Standardized routines
Organizational responsibilities
Technical aspects
Information structure
Security policies and technology
Filtering
Amount of data problem
Visualization
System adaptively
System support for information creation
Common terminology and definitions

These variables received about the same rating (mean values) in their realization in BI systems as the original dimensions from literature. The survey indicated that most of the information quality dimensions from literature and variables from interviews *tend* to be realized. We however claim that this should not be viewed as good enough and hence information quality according to our used framework is a problem in many systems. Only security and relevance received results from our survey that indicated a significant

realization. Neither was security an issue according to our respondents. The total number of dimensions in our framework was 15, making it 2 out of 15 dimensions with significant realization.

The variables in table 7.1 were thought to increase information quality. Our survey indicated overall acceptable positive relationships that concurred with the interviews some of them however stood out. The system's ability to change dynamically seemed to have a very strong positive relation with the information accuracy and a common terminology and definitions affected consistent representation of the information in positive way. The possible relations related to accessibility indicated no relationship between variable and dimension. As discussed in chapter 6 this could be explained by a lack of awareness about the subject among respondents.

We conclude that information quality is overall indicated to be poorly realized in business intelligence systems but this can be alleviated by working with the proposed variables. However in some cases there is a need for deeper understanding about the relationships and also possibly new variables.

## **7.2 Limitations**

Our findings are, besides the literature, based on the combination between our interviews and survey. The fact that our survey questions were largely based on our interviews could have unsound implications and limit our findings if the interviews would be found to be poorly performed and analyzed. Another limitation could be that interview participants do not necessarily have complete knowledge of information quality, hence affected the results of the survey.

As explained we argue that our close connection to one framework has improved the structure of this thesis and our findings. We have however by using this approach perhaps limited ourselves to explore the whole concept of information quality because its effect on structuring the interviews and survey. It is important to consider our findings in relation to the used framework and consider the possibilities that a different starting point could produce different findings.

## **7.4 Future research**

This thesis has highlighted the realization of information quality in BI systems and especially looked at variables that were indicated, by our interviews, to affect the quality dimensions proposed by Strong et al. (1997). One way of picking up where we have left off would be to further study the variables that we have found and their relation to information quality. It could for example be interesting to study whether some of the variables found in the interviews and their possible impact on dimensions, since we found a lack of such relations, and if they actually could be quality dimensions themselves in the sense that they are always a part of information quality to such an extent that they require special attention.

Another possible area for future research would be to put more focus on the relationships between the dimensions within the framework to give an even deeper understanding of information quality realization and perhaps establish some dimensions that are more important than others when realizing information quality.

We also argue that the work with identifying additional variables that could help to realize information quality would be an interesting field to explore.

Also studies which apply a similar approach as ours would be interesting, for example a proper case study approach could provide concrete findings when researching the developers views of information quality and compare it to users of their products.

Finally we would like to see further academic work conducting the same kind of research but with different frameworks to possibly reject or enhance our findings. We would also be interested in academic work combining different information quality frameworks.

## Appendix A - Interview Guide

### Introduction

- Information Quality and Data Quality has the same meaning.
- Try to provide and communicate your own take and views in the topic, rather than corporate policies etc.

### Introductory questions:

1. What is your role in relation to BI?
2. How long have you been working with BI?
3. How would you describe information quality?
4. What is information quality according to you?
5. Is information quality important?
6. Why is it important?
7. In what way and how is it important?
8. Are you working actively with information quality today?

### Intrinsic - the mismatch among sources of the same data

9. Do you consider it to be important that the information produced in a BI-system is accurate?
10. How do you try to achieve accuracy in practise?
11. Is it important to uphold objectivity when information in a BI-system is produced?
12. Alternatively: Is it important to prevent subjectivity when information in a BI-system is produced?
13. Do you try to prevent subjectivity when information in a BI-system is produced?
14. How do you in practise prevent subjectivity when information in a BI-system is produced?
15. What makes information trustworthy?
16. How does one make information trustworthy?
17. Could one prevent information in a BI-system to get a bad reputation?

### Accessibility - relates to how accessible the information is to the user

18. Are there any problems with accessibility to information in BI system?
19. How can these kinds of problems be solved?
20. How does access security affect the quality of information?
21. How do you work with security in information?

### Contextual - addresses problems where the user complains about utilization of the information

22. How important is the completeness for the quality of information?
23. How is the user aided in determining whether the information is complete or not?
24. How can the relevancy of the delivered information be supported?



25. What is meant with valuable information?
26. What do you do in order to increase the value of the information?
  
27. How is information kept up to date?
28. How can information be delivered on time, when it is requested?
  
29. Is there a problem with the amount of information that is produced and delivered in BI-systems?
30. How can it be assured that the user receives the data required for each situation?

**Representational – How information is presented and visualized towards the user**

31. Do you work with increasing users interpretability of information?
32. What is important when information is presented?
33. How important is it to represent information in a consistent way?
34. How is this implemented?

**Debriefing:**

35. Is there anything within the area of information quality and BI-systems that you would like to add or miss?
36. Is there anything else you would like to add or do you have any other questions what so ever?

## Appendix B – Interview agreement in Swedish

Denna intervju har som syfte att få en bild över hur ni ser och arbetar med informationskvalitet och hur ni försöker realisera dessa tankar och intentioner i era BI verktyg.

Vi kommer att använda materialet från denna intervju, i kombination med ett ramverk för informationskvalitet från litteraturen, som grund till att skapa enkätfrågor som ska skickas ut till användare av BI verktyg.

Det går bra att vara anonym om ni så vill. Om så är fallet kommer vi endast presentera den information ni har förmedlat och inte er identitet.

Denna intervju kommer med erat godkännande att spelas in och sedan transkriberas.

Vi kommer sedan att skicka denna transkribering till er så ni får möjlighet att kommentera och godkänna. Vi kommer även skicka er vår analys och diskussion kring intervjuerna. Vi vidtar dessa steg för att undvika att vi lägger in subjektiva åsikter samt att ert namn inte skrivs i kombination med något ni inte vill.

Vår uppsats kommer att bli offentligt publicerad och vi vill därför försäkra oss om att ni förstår er inblandning. Man ska dock komma ihåg att vi inte undersöker er förmåga att utveckla BI verktyg utan vi undersöker om användare av BI verktyg uppfattar realiseringen av informationskvalitet på samma sätt som er och huruvida denna stämmer överens med vad vi har funnit i litteratur.

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Härmed godkänner jag min medverkan i denna intervju och arbete:

Önskar ni att vara anonym? Ja [ ] / Nej [ ]

Namn:

Underskrift:

Plats/Datum:

## Appendix C – Interviews

### Interview A - Mr Stefan Dagesson

1.	J	<b>Vi börjar med lite inledande frågor för att få igång diskussionen lite. Så om du börjar lite med att berätta lite om din bakgrund och din roll i förhållande till BI?</b>	
2.	S	Min roll är egentligen att hela tiden modellera, och skapa struktur i information så att den såväl som möjligt och så objektivt som möjligt avbildar det som händer i en verksamhet och hur en verksamhet är i sin natur. Och det skapar också grundförutsättningarna för bra BI. Att kunna titta och se och förstå sin verksamhet på intelligent sätt, vilket jag också inkluderar i ett bra BI. Så min roll är väl egentligen att skapa en bra grund för BI.	DESCR
3.	J	<b>Mm...Ungefär hur länge har du arbetet med BI?</b>	
4.	S	Jag har, kring själva grundmodelleringen och det som är förutsättningarna för BI så har jag jobbat i 20 år, 21 år. Sen att börja tänka mer i det här med warehouse tänket och det så har jag jobbat i 10-12 år, någonting. Med det fokuset också då, inte bara grunden utan hur man kan vända o vrida på informationen få ut information och analysering.	DESCR
5.	J	En gedigen erfarenhet får man säga! Om du skulle beskriva informations kvaliteten lite kort och fritt, hur skulle du göra det?	
6.	S	Ja, egentligen skulle jag vilja börja i andra änden. Kvalité är ju alltid svårt att definiera i och för sig. Men egentligen skulle jag vilja vända det till att informationen är i slutändan till för att fatta beslut i situationer på hög och låg nivå. Kvalité för mig blir då att man har så relevant information som möjligt då egentligen i varje situation och att den informationen så väl som möjligt avbildar det som har hänt. Så att man skapar sig en bild utav hur någonting verkligen förhåller. Sen är det också kvalitet att kunna dela denna bild och kunna ha samma tolkning av den. Så mycket som möjligt ha samma tolkning av den som alla i verksamheten som jobbar mot samma mål. Så att den också är tolkbar. Och att den är relevant och att den är rätt, att det är rätt information. Och att man ska kunna drilla sig djupare i den.	CR IA IO, RI IO, RI CR, IA
7.	J	<b>Tycker du att informationskvalité är ett viktigt begrepp?</b>	
8.	S	Ja, oerhört viktigt. Helt avgörande för hur väl en verksamhet fungerar.	DESCR
9.	J	<b>Mm, varför tycker du att det är viktigt?</b>	
10.	S	För att den är... Om man går tillbaka till informations kvalite. Information är egentligen en reflektering av verkligheten och för att kunna förstå analysera och fatta rätt beslut kring en verksamhet som man ska styra mot nya mål så är det viktigt att man har kvalite i den avbildningen egentligen. Vilket är information men att den är så pass korrekt som möjligt så man kan skapa sig en så bra bild som möjligt, dels hur verkligheten har sett ut men även hur den ska se ut. På olika abstraktionsnivåer, dels på en konkret nivå men även på en högre nivå så man kan arbeta sig framåt i tiden. Så information, den är liksom, det är mitt styrmedel egentligen, det är mitt sett att skapa mig en gemensam corporate	

		brain för en verksamheten, att göra den visuell. Det blir allt viktigare i verksamheter idag, eftersom de blir bara mer och mer abstrakt kunskap och mindre och mindre proportionellt rent fysiska ting.	
11.	J	<b>Väldigt intressant! Anser du att det är viktigt att informationen som produceras i ett BI system är korrekt, akurat.</b>	
12.	S	Ja, det är helt avgörande. Sen kan man aldrig nå sanningen fullt ut, men den ska vara tillräckligt uttrycksfull egentligen. Man kan ju ha behov av olika granualitet hur väl definierad den ska vara beroende på vilken roll man har oh vilket behov man har. Men man ska kunna beskriva den utförligt.	IA CC
13.	J	<b>Ok, men det som presenteras ska vara korrekt?</b>	
14.		S: Ja, och det ska också vara så att flera personer i verksamheten, eller alla som är berörda av den informationen ska tolka den på ett likartat sätt.	IO
15.	J	mm	
16.	S	Och det har med korrekthet såväl som hur det är möjligt.	
17.	J	<b>Hur försöker ni uppnå korrekt information?</b>	
18.	S	Egentligen handlar det om att hitta tekniker för att avbilda just verkligheten egentligen, sen verksamheten och dess omvärld på ett så bra sätt som möjligt. Och det gäller att göra det på ett sätt så att man också kan förändra, verksamheten förändras så informationen måste också kunna förändras i samma takt. Det gäller att hitta de stabila byggstenarna för att beskriva hur en verksamhet ser ut i sin grund sen ska man i olika skikt definiera upp hur verksamheten ser ut, hur är den organiserad, vilka processer den har, hur produkterna och tjänsterna ser ut. Så att det är egentligen att hitta de här mönstren och lagra det i ett format så dem i verksamheten kan förändra det här i den takt verksamheten förändras.	IA IA
19.	J	Är objektivitet något som är viktigt att upprätthålla hos informationen?	
20.	S	Ja det är det, så långt det går ska den beskrivas från sin grund och utifrån hur det egentligen ser ut, hur den ser ut i sin natur. Då kan man gå in från olika vyer och titta på den från olika håll så att man inte låser fast vissa perspektiv hur man beskriver information i sin grund utan det ska man kunna lägga på ovanpå sen för att titta på samma information. Det är viktigt att den är objektiv i grunden.	IO
21.	J	vid skapandet av information?	
22.	S	Ja precis, att den är rätt från källan om man säger så.	IO
23.	J	<b>Går det här att förhindra på något sätt, subjektivitet då och öka objektivitet?</b>	
24.	S	Ja egentligen är det att sluta tänka cleansing och rensande och mer tänka rätt från källan, så mycket som möjligt och att kunna definiera upp och beskriva hur saker o ting ser ut i sin natur och se till att det blir rätt från bärjan. Den som registrerar datan ska göra detta enligt ett mönster.	IO
25.	J	<b>Är detta något ni jobbar aktivt med idag?</b>	
26.	S	Ja det är hela vår kärntanke.	IO
27.	J	<b>Vad är det som gör att information blir trovärdig?</b>	

28.	S	Det är att man kan lita på den het enkelt. Att man vet att den kommer in rätt och att rätt person har rätt ansvar och beskriver tillräckligt mycket den företeelse i verksamheten som är i fokus.	IB
29.	J	Hur kan påvisa att den faktiskt är trovärdig?	
30.	S	Egentligen kring att kunna skapa en transparens i informationen så att man hitta tillbaka till källan och då är det klart att vi tycker man ska göra det med så få led som möjligt. Information har den fördelen som logisk struktur att man behöver inte flytta den så mycket, utan den kan ligga på ett ställe, sen kan den förändra state och versioner istället. Det finns en mycket större garanti för kvalitét och att kunna garantera den här kvalitén egentligen att man hanterar så mycket som möjligt på ett och samma ställe.	IB
31.	J	Kan man motverka att information i ett BI system får dåligt rykte? D.v.s. att den inte tas väl emot.	
32.	S	Ja det tror jag genom att... egentligen genom att skapa tillförlit att den är kvalitativ att man kan lita på den och att den är tillräcklig och att man kan få ut den informationen och den analysen så att säga, det beslutsunderlaget som man behöver ifrån informationen. Så att den inte är tvättad i för många led så man inte litar på den. Vilket ofta är fallet idag, de samlar ihop massa med data i ett warehouse sen är det ingen som vågar lita på det för det är för långt till källan.	IR-IB CC CR IB
33.	J	<b>Det är väldigt intressanta tankar! Jag kommer nu gå in på en annan kategori av informationskvalité som benämns som tillgänglighet. Finns det ett problem med tillgängligheten hos BI system idag?</b>	
34.	S	Ja det tror jag, dels tror jag att man har... vissa stora företag verkar sig skapa stora warehouse lösningar som de inte får rätt med strukturmässigt för att de har öst in data från olika källor och sen försökt lösa det i efterhand vilket gör att informationen kanske finns där men att den inte går att få ut på något vettigt sätt i efterhand. En annan lösning är att de kanske köper in sitt lilla favorit BI system och sitter lokalt i sin del av verksamheten och tankar in det, istället för att köra excel så lyfter man in det o kör det i sin lokala del. Då kanske man kan lita på sin lilla ö, men hur den förhåller sig till verksamheten i övrigt är väldigt vagt ofta. Man tar inget helhetsgrepp och försöker titta på de grundläggande mönstren som behövs för att skapa ett bra BI. Man kan ha tillgänglighet för sin lilla ö, men man kan inte titta på det på olika nivåer i olika transparens. Tillgängligheten högt blir ofta på en hög nivå, top management nivå blir ofta dålig eftersom det är så många skikt och lager emellan.	CA IA
35.	J	<b>När du menar tillgänglighet, menar du då att informationen går att få tag på men är svår att få tag på eller menar du att det överhuvudtaget inte går att få tag på den?</b>	
36.	S	Egentligen båda då. I de fallen när man har gjort de här stora lösningar, när man köpt in teradata eller någon annan stor lösning som finns. Så finns informationen där men den är svår att tolka förstå och jämföra eftersom... den ligger där, man har försökt tvätta den ofta, men den är ofta inte tillräckligt ren, inte ren från källan helt enkelt. För många andra som har låtit tusen blommor blomma så har man låtit många delar av verksamheten köpa in BI, då är problemet att då har man inte informationen, då finns den fysiskt inte tillgänglig. Jag tror båda problemen finns.	IA

37.	J	<b>Ok, hur kan man lösa dessa problem?</b>	
38.	S	Att börja tänka struktur från grunden, börja titta på att sortera in information enligt ett visst mönster. Egentligen inte svårare än att man ska skapa en struktur i en verksamhet och ett sätt att kommunicera. Så det är egentligen så att man ska ha ett gemensamt språk att beskriva sin verksamhet. Att ha många olika system och många olika excel gör att det blir väldigt svårt att kommunicera. Så det är en grundförutsättning att skapa sig ett verksamhetsspråk. För att kunna beskriva detta. Och det är fullt möjligt att göra.	IA RCTR RCTR
39.	J	<b>mm. Påverkar säkerhetsaspekter, säkerheten hos information kvalitén?</b>	
40.	S	Den borde inte göra det. Men det finns många, jag har råkat ut för ganska många gånger då det begränsar. Jag har träffat många organisationer som tycker det är en risk att samla all information på ett ställe, eftersom det då finns en risk att obehöriga personer får tag på den. Vilket man kan förstå på ett sätt. Men det är ändå en ganska hemsk tanke att man inte vågar samla information på ett ställe gemensamt och få en bra källa till kunskap för att man är rädd för en konkurrent ska få tillgång till informationen som man annars inte ens själv har. Jag tror att det är viktigt att man har en bra behörighetskontroll och säkerhetskontroll. Börjar man samla det på ett ställe finns det iofs risk för att den sprids. Kommer man åt kärnan så kan man ju åt mycket mer känslig och viktig information, samtidigt behöver ju verksamheten denna. Har man bara ett ställe har man också bara ett ställe att kontrollera säkerheten på. Det är viktigare att man utvecklar kring den kärnan istället.	AAS
41.	J	<b>Men du har sett indikationer på att kunder anser att om informationen läcker ut så minskar informationskvalité, d.v.s. att den blir mindre värd då?</b>	
42.	S	Ja eller att den...Ok i förhållande till kvalité... Om man ser det sambandet då, att man vänder på det, om man ser ett samband i det att det finns en risk att samla all data, så på det sättet. Om man har det synsättet att det är bättre att man har informationen lokalt så kommer det att påverka informationskvaliten och man begränsar sig vid den tanken. Att man inte vågar tänka sig att man har en källa där man har ett säkerhetslager utan att man tänker sig att alla sin lilla burk med information, då påverkar det kvalitén. Man måste våga tänka hur verksamheten ser ut och sen lägga på ett säkerhetslager. Det är jätteviktigt att göra detta rätt. Man kan inte vända o vrida på informationen om den är så isolerad. Detta är också en anledning att många outsourcar sin information idag. Utan att riktigt tänka efter vad det är man outsourcar. Man outsourcar kanske det viktigaste man har, kunskap och information, man lägger ut det på massa leverantörer. Men det kanske också är för att man inte ser på det som en kritisk framgångsfaktor, det är ganska synd.	AAS
43.	J	<b>Jag har fått en ganska bra bild av hur du jobbar med säkerheten hos informationen. Då går vi in på nästa kategori frågor, tredje kategorin som handlar om kontextuella bitar hos information. Hur viktigt är det att informationen är fullständig och komplett för att den ska vara kvalitativ?</b>	
44.	S	Egentligen ska den mer vara situationsanpassad. Det är iofs en	CR

		fråga om definition på fullständighet. Det kan ju bli för mycket information också, den är korrekt och rätt avbildad av verkligheten så kan det vara mycket mer information än vad man behöver. Så det är inte givet att den behöver vara fullständig utefter den definitionen.	IA CC
45.	J	Kan man hjälpa användaren på något sätt att avgöra huruvida informationen är fullständig, d.v.s. är det här all information eller är det bara en fraktion av informationen.	
46.	S	Egentligen så känns det som... i många lösningar och i många situationer idag så vet man inte. Man har inte någon helhet som man kan avgränsa för just den situationen riktigt utan det blir fota brus där man inte har tillräckligt med information, t.ex. när jag jobbade med värden så vågade man inte riktigt lita på den information som var där. Man vet inte om den är tillräckligt väl beskriven, man tar nya tester och frågar ytterligare en gång om de är rökare t.ex.. Man vet helt enkelt inte om man har tillräckligt information. Men kan man lita på, och styra upp det så man har en struktur där ifrån man vet att rätt personer delegerar rätt information eller möjligheten att titta på rätt information i olika situationer så skapar man också förutsättningar för att användaren kan lita på den och känna sig trygga i att det är den information man behöver. Ofta genom lösningar där man kan dela upp och titta på de detaljer man behöver, men att man kan känna att man får tillräcklig information. Idag är det ofta ett problem att man vet inte detta.	CC  CC  CC-IB
47.	J	<b>Kan man på något sätt bidra till att den information som levereras till användare är relevant?</b>	
48.	S	Ja det är ju, ja just det. Egentligen är det så att man måste kunna hantera vyer. Jag har haft dialoger med kunder där man har suttit o velat lägga information i olika högar eftersom det känns säkrare. Då vet man att det är ingenjören, konstruktören ska ha den informationen när man säljer ska kunden visas den informationen och någon annan ska ha den informationen. Så delas det upp i olika högar och man känner sig trygg. Problemet är ofta då att man skapar då dessa öar där stor del av informationen egentligen är samma information som finns på ett annat ställe. Det som är viktigt för att verkligen kunna hitta och ange vad som är relevant är att kunna hantera vyer utefter en helhetsmodell. Det är även olika hos olika kunder. Vissa är mer intresserade av detaljer och veta hur saker och ting är löst med vilken teknologi, och andra kanske bara bryr sig om vilken funktionalitet de har vilken förmåga som finns i olika situationer. Så det gäller att kunna styra det här med relevansen mycket genom att lyfta upp informationen i vyer. Men det kräver att man har en gemensam struktur, har man inte det i botten så är det mycket svårare. Annars ska man ha till olika programmerings och systemlösningar för att få fram rätt information, det hinner man aldrig med i tiden, det blir för trög rörligt system.	CR  CR  CR IO, RCTR
49.	J	<b>Vad inbegriper värdefull information?</b>	
50.	S	Hmm... För mig spontant känns det begreppet väldigt nära kvalitativ information. Det känns som att värdefull information borde vara det som är situationsanpassad, den information jag behöver för ett visst beslut, den information som är värdefull i en viss situation.	REL CV
51.	J	<b>Så du likställer det med kvalitativ information?</b>	

52.	S	Ja rent spontant så känner jag så.	REL
53.	J	Då går vi vidare lite här. Hur håller man information väl uppdaterad?	
54.	S	Att se till att den alltid uppdateras från källan. Så om man tar världen igen där man sitter idag och samlar på sig kluddiga anteckningar och sen försöker man gå in o skriva i någon textjournal när dagen är slut och patienterna har gått hem. Ibland sitter man med diktafon och någon sekreterare får skriva in. Det är för många led emellan. Det gäller att hitta tekniker där man så snabbt och effektivt som möjligt får in information på ett strukturerat sätt. Man ska inte heller behöva skriva långa uppsatser om saker och ting utan kunna få in det med tekniker på ett snabbt och effektivt direkt från källan.	CT
55.	J	<b>Hur kan man leverera information så snabbt som möjligt inom en given tidsram när den behövs? Vi har varit inne på det tidigare att det är viktigt att informationen leveras inom en viss tidsram.</b>	
56.	S	Mm dels kan det vara rent prestandamässiga grejer, men för att få tillgång till information så är det också mycket att inte ha för många led och att informationen finns på olika ställen så att man måste samla ihop den och tolka den i efterhand utan det är att försöka korta leden, informationsförädlingsleden så mycket som möjligt. Det gör det också att man kan få den mycket snabbare. Det gör också att man kan börja lägga den i en modell där man leidoskopiskt kan börja titta på information så är det mycket snabbare möjligt att vända och vrida på samma information och titta på den ur olika vinklar istället för att springa någon annanstans och kolla rapporter eller beställa den från någon annanstans. Så det är mycket att skapa denna multidimensionella modellen i botten så man kan vända o vrida på informationen i sin natur. Hitta rätt information, drill mig ner i rätt information, drill mig upp i avbildningen av verksamheten.	CT
57.	J	<b>Finns det problem med mängden information, vi har varit inne på det tidigare. Finns det problem med mängden information som produceras och levereras i BI system idag?</b>	
58.	S	Ja det tror jag absolut. I alla fall i de här stora satsningarna. Där man öser in stora mängder information. Där försöker man då med olika data marts och allt vad det heter, försöka olika slags skärningar i den här informationen. Mängden i sig bör inte vara något problem. Jag tror oftast att man inte har något sätt att zooma in och ut information på något effektivt sätt så ligger man ofta på en för grov eller detaljerad nivå. Ligger man på en för detaljerad information finns det ofta en risk att man går bort sig i informationen.	CA CA
59.	J	<b>Det finns alltså ett problem i att man får för mycket information?</b>	
60.	S	Ja att den kanske är för detaljerad. Många forecast system idag är uppbyggda kring att man ska ner på artikelnummer nivå, men det är ingen som är intresserad av en forecast på den nivån. Man kan inte... mängden information är ofta relaterad till att man inte kan hantera abstraktionsnivåer utav verksamheten på rätt sätt. Det samma inom produktstrukturer så är det mycket att man kring, att man är nere på artikelnummer. Det skapar en sån kombinatorik, man ska tala om en kombination av alla möjliga tillval och	CA



		kombinationer som man kan göra för en viss produkt i ett sammanhang. Man kan inte hantera den, det blir för stora mängder information. Det handlar mycket om modellen man har för att hantera informationen, man ska göra det på en högre abstraktionsnivå.	
61.	J	<b>Hur arbetar man med att få den information som situationen behöver?</b>	
62.	S	Det ligger i det att kunna göra det ganska dynamiskt så att man inte behöver ha... situationen är förändrad efter att ha gått igenom en systemutvecklingsfas. Egentligen ska man ha en modell där man kan förändra sig ganska dynamiskt, där man kan definiera om en vy eller definiera om en behörighet. Så att kunna styra det som krävs i en viss situation. Eftersom situationer ändras hela tiden så ska du egentligen kunna definiera om vyer till det som situationen kräver och kunna definiera om behörighet. Det här beror på ju på möjligheten man har att lägga det i en gemensam kärna. Men har man såväl som möjligt definierat upp systemet gemensamt så har man i alla fall större föreställningar att kunna växla och ge tillgänglighet till olika informationsmängder.	CR  IA
63.	J	<b>Nu går vi vidare på fjärde kategorin. Presentationen av information, hur man presenterar den. Gör ni något för att öka användarens möjlighet att förstå och tolka information?</b>	
64.	S	Det finns många sätt, det kan man göra på många sätt. Det försöker vi göra, vi skapar mer och mer tillämpningsvyer av informationen som gör att man kan titta på den och förstå den bättre. Förstå samband bättre. Det är mycket i hela vårt tänk som gör att man kan förstå den bättre och visualisera den bättre. Det jobbar vi mycket med, men det kan man hela tiden arbeta mer med. Det är jätte viktigt.	RI  RI
65.	J	<b>Vad är viktigt då när man återger och visualiserar information. Om du tänker på själva presentationen av den.</b>	
66.	S	Dels beror det på informationens natur då iofs. Det kan ju vara väldigt tilltalande att göra 3d format och göra det tydligt på det sättet. Det kan vara bra för att se grova samband, om man går in analyserar mängder av information. Då måste man hitta sätt att hantera det. Men att jobba mycket grafiskt med ljud och bild och kommunicera till olika sinnen egentligen. Skapa en levande bild av verksamheten eller den verklighet man avbildar. En avbildning av det som ett dataspel som avbildar verkligheten. Det handlar ju mycket, för att återgå till den här med tolkningen, det gäller också att kunna beskriva informationen med strukturerade termer. Ofta upplevs det som tyngre till att börja med, som exempelvis vården igen, att läkare ska tvingas gå ner o strukturera och ange olika värden för exempelvis blodtryck, vilken utrustning som använts osv osv. Även om en läkare kunde skriva en kommentar innan. Så börjar de inse att ok det är lite mer jobb att skriva in den här informationen men samtidigt så går det att återanvända på ett mycket bättre sätt då. Och jag kan lite på den och tolka den på ett helt annat sätt. Vi hörde berättelser om e.g. höftledsoperationer där läkare väldigt målande berättar om hela operationen, men där de glömt att berätta vilken skruv som är insatt. Men tvingas till att definiera och strukturera information på ett strukturerat sätt gör också att man kan lite på den och tolka den på ett mycket bättre	R  RCR

		sätt då. Det kan kännas jobbare i början men återanvändbarheten är så stor att dom i verksamheten inser väldigt ofta att det totalt sett blir mindre insats behöver leta mycket mindre.	IB RI
67.	J	Är det viktigt att återge informationen på ett konsekvent vis? Att den är konsekvent presenterad?	
68.	S	Ja det tycker. Sen kan det vara olika vyer och olika presentationssätt iofs. Men det är ju i så fall samma information som man beskriver på olika sätt, det är bara att man har olika presentationssätt. Men den ska vara konsekvent på det sättet att två eller tre personer ska få samma information om man tolkar den. Därför är det också viktigt att påpeka att det inte bara är att skapa en informationsstruktur det är också att skapa ett språk en struktur som sätter sig hos alla som jobbar i verksamhetens totala hjärna. Man ska ju förlänga deras hjärnor och utnyttja deras hjärnor mycket bättre i en gemensam hjärna. Då gäller det att man har en mappning som fungerar bra.	RCTR RI
69.	J	<b>Vi har varit inne på det men hur implementeras den här konsekventa informationspresentationen?</b>	
70.	S	Egentligen är det ju att återgå till det här vi pratade om innan att skapa sig ett gemensamt verksamhetspråk. Att skapa sig ett sätt definiera upp saker på ett och samma sätt. Det misstag som ofta görs är då att man modulerar begrepp och termer. Man diskuterar bara termer, man diskuterar termen kund, man byter definitioner så lägger man massa pengar på detta. Istället för att börja titta på och försöka förstå hur det egentligen hänger ihop, att kundbegreppet kanske är för komplext för att beskriva på det sättet. Man kan ha en sammanfattande övergripande definition av kund, man måste bryta ner det i kundens alla roller och bli mer precis i definition. Så det gäller att göra ett riktigt bra modelleringsjobb och hitta det som är stabilt i information och sen beskriva resten som relationer där det förändras och det finns många samband och leverantörsförhållande, det kan vara partners och andra aktörer. Beskriva det så nära verkligheten som möjligt, hur sambanden egentligen ser ut. Då skapar man förutsättningar för att det också ska bli konsekvent.	RCTR  RCTR, RCR   RCTR
71.	J	<b>Nu tänkte jag att vi ska ta en liten kort paus, så man kan ta en liten kort paus så vi kan tänka igenom lite vad vi har pratat om. Så kan vi återkomma lite senare med det man tycker saknas.</b>	

**Interview B - Miss Tove Nilstun**

1.	P	<b>Ja då sätter vi igång, först vill vi bara klargöra att vi ser på lika på informations och data kvalitet och vi ser det som samma begrepp.</b>	
2.	T	Vilka ser det som samma begrepp?	
3.	P:	<b>Ja alltså vi, nu i detta arbetet, informations eller data kvalitet, det kommer behandlas som samma begrepp för data och information kan ju annars ses som skilda begrepp.</b>	
4.		<b>Och sen vill vi att du försöker ge din bilden av hur du ser på områdena och försöka undvika företagspolicys osv, utan mer se utifrån dina erfarenheter och hur du som utvecklare ser på grejerna.</b>	
5.	T	Okej, mm.	IRR
6.	P	<b>Och då har vi lite inledande frågor här, vi tänkte fråga lite om din bakgrund och din roll som utvecklare och med BI och hur den ser ut?, dina erfarenheter.</b>	
7.	T	Min bakgrund är att jag är systemutvecklare och jag har jobbat...började på <i>företag 1</i> och jobbade direkt med information kvalitet utan att egentligen veta om det, med hållbara modeller och den typen av grejer ett antal år. Sen jobbade jag på <i>företag 2</i> ett antal år med massa stora företag och sen hoppade jag av det just för att det var för många snabba och dåliga lösningar som man gjorde, tyckte jag. Nu vill jag inte ställa <i>företag 2</i> i dålig dager offentligt. Och så kom jag hit och här sitter jag mest på utvecklingsavdelningen men jag har en del kunduppdrag också, täcker det?	DESCR
8.	P	<b>Det tycker jag, Hur länge har du då hållit på med informations management-biten och BI?</b>	
9.	T	Alltså Jag har jobbat på Ortelius i 3 år, men	DESCR
10.	P	<b>Dom här tidigare jobben har också varit inom samma område eller?</b>	
11.	T	Nä, nä det har det väl egentligen inte, ja alltså det e klart att det handlar ju om information kvalitet. Så fort man utvecklar ett system så pratar man ju om IQ men inte BI nödvändigtvis, för det känns som att et är högre, men jag vet inte riktigt hur ni definierar BI ?	DESCR
12.	P	<b>BI är väl...</b>	
13.			
14.	CJ	<b>Det är ju nästa fråga annars...hur kan man beskriva information kvalitet...eller jaha BI förlåt.</b>	IRR
15.	P	<b>Ja alltså det e ju typer av beslutstödssystem där man har samlat data , tex DW eller andra typer av DSS, där man samlat data o rensat den eller på nåt sätt strukturerat upp så att det ska kunna fattas bättre och effektivare beslut.</b>	
16.	T	Det är alltså mer övergripande?	
17.	P	<b>Ja lite så.</b>	
18.	T	Ja men då kan man nog säga 3 år, alltså det jag har varit här på Ortelius.	DESCR
19.	P	<b>Okej, Hur skulle du beskriva informationskvalitet? Vad är det för dig?</b>	
20.	T	Ja för det första måste det vara korrekt och korrekt innebär många saker, dels innebär det att det är rätt version alltså senaste versionen. Dels innebär det att det är relevant. Korrekt information...(reflekterande)...Mm.	IA CR
21.	P	<b>Ja vi kommer till mer detaljerat sen också. Anser du att informationskvalitet är något väldigt viktigt?</b>	

22.	T	Ja oerhört viktigt	REL
23.	P	<b>Varför är det väldigt centralt?</b>	
24.	T	För att kunna ta rätt beslut egentligen, eller välgrundade beslut, för att slippa ta beslut på magkänsla, och därmed ta felaktiga beslut egentligen.	DESCR
25.	P	<b>Jobbar ni aktivt med informationskvalitet i ert arbete och utvecklande idag?</b>	
26.	T	Ja det gör vi. Det är så att säga själva essensen av det vi försöker åstadkomma.	DESCR
27.	P	<b>Ok. Nu kommer vi gå in lite på frågor som är behandlade i olika typer av informationskvalitets dimensioner och områden, som vi kommer ställa lite frågor om.</b>	
28.	T	Mm	
29.	P	<b>Och den första är inom inbyggande eller intrinsic, inbyggda informationskvaliteter. Och den första frågan är då, anser du att det är viktigt att den information som produceras i BI system är korrekt?</b>	IA- Intrinsic Accuracy
30.	T	Avgörande!	IA
31.	P	<b>Ja, Hur försöker ni uppnå att informationen, eller fastställa att informationen är korrekt? I praktiken i ert utvecklande?</b>	IA- Intrinsic Accuracy
32.	T	Eftersom man i ett enda system kan se all relevant information om någonting så man får en helhetsbild väldigt snabbt och det är alltid korrekt eftersom det är alltid den senaste versionen som ligger i det här systemet så att säga. Sen har vi ju inte versionshantering Än i vårt system. För det hade ju varit pricken över I:et när det gäller kvalitén i alla fall att man gör många olika revisioner. Men som det är nu så ser man ju alltid det som är senast i alla fall, även om man inte kan göra historiska tillbakablickar.	CR IA IOther - Versions
33.	P	<b>Nästa fråga är angående objektivitet. Anser du att objektivitet är någonting viktigt att upprätthålla när man skapar information i systemen.</b>	IO - Intrinsic Objectivity
34.	T	vad menar du med objektivitet?	
35.	P	<b>Objektivitet menas med, att den data som produceras inte är subjektiv för någon eller den som har satt in den utan det är ett objektivt eller att upprätthålla.</b>	
36.	CJ	<b>Ja alltså när man skapar data så kan det ju vara så att den som skapar datan lägger en objektivt syn och när man säger liksom, antingen göra det som man själv tycker kanske passar bäst, alltså om systemet inte begränsar en, och då skulle man kunna lägga in lite information som man vill.</b>	
37.	T	Men alltså när ni menar subjektivt, menar ni subjektivt utifrån ett företagsperspektiv eller från individen?	
38.	P	<b>Från individen. Som skapar, alltså som lägger in informationen i systemen då. Alltså att man ser att det som kommer in, har på nåt sätt samma ramar för alla, oavsett vem som lägger in datan så att säga.</b>	
39.	T	Ja just det. Det känns ju som et givna svaret är att det skulle vara att det är jätte viktigt att det är objektivt, men jag kan i och för sig tänka mig att det också finns ett värde också i subjektiviteten. Men jag kan inte komma på nåt exempel just nu. Så jag får väl i så fall svara att objektivitet är jättebre.	IO
40.	CJ	<b>Men det kan nog ändå, den tanken är ju ändå intressant för det är sant att det kan finnas ett värde i subjektiviteten också.</b>	
41.	T	Ja det känns så i alla fall	
42.	P	<b>Ja alltså alternativet är ju då att det är väldigt viktigt att man</b>	

		<b>motverka den här subjektiviteten, att människor inte kan vara subjektiva när dom lägger in eller vinklar information. Är det någonting ni försöker motverka när ni utvecklar?</b>	
43.	T	Ja, Alltså man kan ju säga på så vis att de data som läggs in Evolver eller är tänkt att läggas in Evolver är objektiv men ur ett subjektivt perspektiv. Med det menar jag att den måste tillfredställa alla behov, även dom subjektiva behoven, men dom måste göra det på ett objektivt sätt så att alla kan ta del av det.	IO  AA
44.	P	<b>Mm.</b>	
45.	T	Fast med subjektivt behov menar jag egentligen alltså en enskild avdelning, om där nu sitter en eller tre personer eller liksom. Men dem måste tillfredställa och hålla all information som behövs ute till alla företag. Men den ska vara tillgänglig på ett sätt så att alla kan få ut någonting av den och förstå den.	IO  AA CR, CV
46.	P	<b>Ja, nu kommer vi in på trovärdighet i informationen. Vad är det som gör information trovärdig?</b>	<b>Intrinsic Believability</b>
47.	T	Pratar vi typ, att läsa igenom ett dokument eller pratar vi att titta på en rapport i ett BI system. Få ut viktiga siffror osv.	
48.	P	<b>Ja alltså om du hämtar ut data ur systemet, siffror, en presentation eller för att ta ett beslut. Vad är det som gör att du kan lite på det som står där? Eller respektive inte lita så mycket på det.</b>	<b>Intrinsic Believability</b>
49.	T	Ja okej. Det måste ju ha med versionen att göra, huruvida den är uppdaterad. Alltså huruvida jag kan se om den är aktuell. Dels vill jag se när den, alltså när informationen lades in så man kan dra slutsatser om, har det hänt mycket sedan dess. Sen vill man ju veta om det finns någon revidering efter det på den informationen man tittar på som man inte har fått med.	IB, CT IOther - Versions
50.	P	<b>Har du något annat så hur man skulle kunna trovärdighet i informationen bättre. Mer än det som sagts.</b>	<b>Intrinsic Belivility</b>
51.	T	Det skulle i så fall vara objektiviteten också. Det handlar ju också om trovärdighet att man kan lita på det som står gäller för hela företaget eller att det är aktuellt och relevant för företaget.	IO, IB
52.	P	<b>Kan motverka att informationen i ett BI system får ett dåligt rykte?</b>	<b>Intrinsic Reputation</b>
53.	T	Återigen, versionshantering tror jag. Om det e klart och tydligt vilken version och när den skapades och kanske också vem som är ansvarig för informationen. Så får man trovärdighet. Men om det saknas vem som har skrivit, vem som är ansvarig och när den skrevs så är det mycket svårare att lite på.	IR, IOther – Versions  IB, IR
54.	CJ	<b>Upplever du det som ett problem att det ofta kan uppstå trovärdighetsproblem. Att det kanske innan ni kom dit var system som...</b>	<b>Intrinsic Reputation</b>
55.	T	Nä för jag känner att styrkan i det systemet är rätt så mycket trovärdigheten i det. Men det beror mycket på att eftersom vi inte har versionshantering är det alltid det senaste som ligger inne liksom, det är alltid det som är korrekt. För sen är u frågan också, om man har många system vilket man ju har, BI matas ju gärna från andra system, så kanske man har batcher som man kör antingen på natten eller en gång i veckan elelr nåt sånt som om man har nåt mastersystem för någonting där. Så matar man in rätt bara där, sen om det tar en dag eller en vecka eller vad det nu tar innan alla systemen vet om ändringarna det är ju också ett trovärdighetsproblem. Så det handlar ju också egentligen om hur snabbt information flödar emellan systemen. Om hur man kan veta att man	CT IA  CT  CT

		tittar på den senaste informationen. För det är ju svårt att veta, även om där står ett datum på en information, så är det svårt att veta det är gjort någonting efter det. Det kan vara gjort för ett år sedan men det kanske är lika aktuellt fortfarande. Så det är ju en trovärdighetsfråga som är svår.	CT, IA IB
56.	CJ	<b>Hur jobbar man då med det för att användaren ska kunna se att det är den senaste versionen och kanske då hela vägen ner till grundsystemet? Att det uppdaterades där och batcher har gjorts osv?</b>	<b>Transparency?</b>
57.	T	Mm, jag vet inte. Men det är en väldigt intressant fråga och den är ju väldigt aktuell för oss. I och med att vi inte har versionshantering så har egentligen inte det problemet än.	IB  Iother - Versions
58.	CJ	<b>Nä. Men hur tror det är utanför Evolver, är det ett problem eller tror du att...</b>	<b>IB – Intrinsic Belivability</b>
59.	T	Jag tror att versionshanteringen och det här med att om man ser att det är senaste data och om det är ändrat efteråt. Jag tror det är det största problemet som finns inom organisationer överhuvudtaget. Jag tror det är därför man tar så många magkänslö-beslut, därför att man litar inte på informationen. Även om man får fram informationen så är man osäker på om den är rätt eller. Om den är aktuell helt enkelt. Så man litar inte riktigt på den och då tar man hellre ett magkänslö-beslut. Eller så springer man runt som en däre och försöker få fram rätt information. Sen när man har det så känner man ändå att det är det här verkligen...nu jag fick rapporten från någon för en vecka sen och så ska jag sammanställa det och det kan hända mycket på en vecka och ...så jag tror det är ett superstort problem med trovärdighet. Men jag har ingen konkret lösning än, men det är intressant du nämner det för jag ska börja fundera på det.	CT  IB  AA CT  IB
60.	P	<b>Nu kommer vi in lite på tillgänglighet eller accessibility. Som då relaterar hur tillgänglig informationen då är för användaren i systemet. Anser du att det finns ett problem med tillgänglighet som det är idag, generellt sett?</b>	<b>A – Accessibility</b>  <b>AA – Accessibility</b>
61.	T	Generellt sett?	
62.	P	<b>Ja du behöver inte alltid svara utifrån er vara utan ifrån din erfarenhet eller din inblick i marknaden.</b>	
63.	T	Problemet är ju att jag inte har så mycket jättemycket erfarenhet av användandet av BI system, för det är det vi pratar om fortfarande?	
64.	P	<b>Ja eller DW eller så här</b>	
65.	T	För jag har inte så jättemycket erfarenhet av DW system. Men vad var frågan?	
66.	P	<b>Alltså om tillgängligheten till information för användaren är ett problem ni ofta stöter på?</b>	
67.	T	Och då kan prata tillgänglighet som i att dom har svårt att hitta information i systemet? Eller tillgänglighet som i att systemet inte är tillräckligt tillgängligt?	
68.	CJ	<b>Både och</b>	
69.	T	Både och, okej. En reflektion är ju egentligen att i andra vanliga BI system så att säga om man inte räknar in värdet så, fast det här är mer ett	

		antagande än någonting som jag vet, men det känns bara som att med statistik kan man ju trolle och få fram vilka siffror som helst och då är det ju föga trovärdigt om man inte får reda på hur allting är framtaget, hur har ni fått fram den här statistiken, hur har ni gått tillväga osv eftersom man kan vrida och vända på allting och det känns väl lite som att det borde finnas samma möjligheter i ett BI system att man kanske sätter samman information på ett visst sätt...för det gynnar aktieägare eller för att man får fram vissa vinklar som är positiva och.....vad nu det har med tillgänglighet att göra.	IB IB
70.	CJ	<b>Annars tyckte jag du var inne på ett bra spår där också. Men jag tror vi kommer lite mera till det senare. Relevans osv. Men du var inne lite på tillgänglighet där när vi frågan om det här med trovärdigheten och att det är ett stort problem att det tar en vecka och då har du ju kanske inte den informationen du vill, om det tar en vecka för dig skaffa den här informationen så är den ju egentligen inte tillgänglig. Det kommer ju sen lite också när vi pratar om timeliness, att den är tillgänglig vid rätt tid också. Just tillgänglighet är väl dels att det finns på rätt tid på rätt plats i det formatet du behöver, men också att den kanske att man tänker att man är trådlöst ute och man vill fortfarande ha tillgång och sådant. Så det är ganska brett. Just det här med att det kanske måste bearbetas så länge att den inte är tillgänglig när du behöver den.</b>	
71.	T	Ja okej. Och det är väl intressant egentligen, därför att ofta är det väl så att sitter man på styrelsemöten eller ledargruppsmöten och ska ta övergripande beslut om saker och ting, vilka projekt vi ska startas och vilka vi ska avsluta och var vi ska lägga pengar och så vidare. Så vill man ju ha en bra överblick som är det senaste och det som är "sant" och det kanske man inte har just där och då. För att då måste man göra någon omladdning i sitt BI system och man måste skriva någon rapport för att få ihop det man vill ha och då kanske man kanske man har missat aspekter också i dom rapporterna. Så det känns lite som att maximal tillgänglighet, då hade man suttit på det här ledningsmötet och kunnat skruva i realtidsinformation där och då. Och det tror jag inte man kan för jag tror det är många som tar ut rapporter om man ska ha ett stort ledningsgruppsmöte om en vecka, så tar dom ut rapporter om en vecka så måste dom sammanställa det. Och då blir den inte helt aktuell och att det då har med tillgängligheten att göra.	IA CT AA CT CR AA
72.	P	<b>Så man kan säga att det inte är tillägnligt hela tiden direkt då också påverkar att man inte får den fullständiga informationen man behöver kanske?</b>	
73.	T	Ja precis och att man inte kan köra dom (*knäpp*) sådär och få fram vilken information man vill utan den måste förberedas innan och ställer andra frågor på mötet än man tänkte att man skulle ställa från början så har man inte den informationen tillgänglig för då måste man skriva nya rapporter och som hämtar ut informationen ur det perspektivet man nu ställer frågan.	AA CR CR
74.	P	<b>Sen någonting som också handlar om tillägnlighet kan ju vara access, tex. att inom världen måste man skydda integriteten och ja själva säkerhets-biten kan ju också påverka att man blir tillåten att få tillgänglighet. Vad har du för uppfattning om hur det kan påverka kvaliteten i information?</b>	
75.	T	Det har jag faktiskt aldrig funderat över. Skulle kanske vara att man är rädd för att om man är begränsad och bara får se viss del av informationen att då tolkningarna man gör utifrån den delen av	AAS RI,

		informationen inte blir korrekt enligt hur informationen ser ut i helheten, För att man inte har tillgång till den informationen och då kanske man tar felaktiga beslut, man känner sig osäker på om det är rätt eller inte.	CC AAS, AA
76.	P	<b>Men hur kan man på nåt sätt jobba med säkerhet jämfört med tillgänglighet eller med tillgången till information, hur balanserar man här?</b>	
77.	T	Man kanske skulle kunna kanske ge avidentifierad tillgänglighet till saker och ting eller berättighet till saker och ting så även om man inte får se vad en viss person har för diagnos för att man inte har dom rättigheterna. Så kanske man kan få en sammanfattad bild av hur läget ser ut som kanske är avidentifierad för dom som har det. Jag har en känsla av att dom enda som har all information är dom som sitter absolut högst upp och längre ner i organisationen vill man nog alltid ha, så länge man kan garantera att informationen håller kvalitet dvs att den är korrekt, så vill man alltid ha mer information än vad man har. Och då är det möjligt att en avidentifierad version av informationen hade kunnat hjälpa upp. Så man har rättighet till vissa rapporter som man inte länkar till objekten.	AAS AA, CC, CR
78.	P	<b>Nu går vi in på den mer kontextuella delen av informations kvalitet som är kopplat till kontexten. Hur viktigt är det att informationen är fullständig för att den ska vara kvalitativ?</b>	CC - Completeness
79.	T	Det är ju lite det som vi har varit inne på...	
80.	P	<b>Ja vi har ju berört det lite, men det går ju lite hand i hand, men om det är något du kan tillägga.</b>	
81.	T	Ja om det är så till vida att man inte har en fullständig information så är man ju rädd för vad man missar för någonting. Och man vet ju inte om det man missar motsäger det man kan se. Och om saker man inte har tillgänglighet till gör att siffrorna visar i helt andra riktningar än det man har tillgång till. Det kan ju också vara så att man förlorar perspektivet om man får lite access till information, så blir man så väldigt snarsynt, man får liksom inget vidare perspektiv om vad som är bäst för företagets helhet. Utan eftersom man bara ser sin egen lilla bit så är det de enda man fokuserar på och det är ju till nackdel för organisationen och då kanske man skulle vilja se information om hur det funkar över hela spannat. Jag tror att en del av informationsproblematik och när man arbetar med processer är att man har sin lilla del sen bryr man sig inte så mycket om dem som tar vid efteråt utan nu har jag gjort mitt så nu "skiter jag i resten". Medan man hade behövt ha ett djupseende tvärs igenom organisationen för att se hela processen och se nyttan med sin egen lilla del i det stora hela. Både så att man rationalisera bort saker som faktiskt inte är viktiga i det stora hela som verkar väldigt viktigt i ett litet perspektiv. Eller projekt som startas eller avslutas osv. Att det är enligt riktlinjer som kommer uppifrån från styrelser osv.	CC AA, CC, CR AAS C, CR CR, CV
82.	P	<b>För det handlar ju lite nästa fråga om här också, hur man då hjälper användaren att avgöra om den är fullständig eller inte? För om dom ser en liten bit så...</b>	
83.	T	Ja det skulle i så fall vara att om man tex. pratar rapporter eller statistik eller så, att om dom kan dra ut statistik på det som gäller deras avdelning eller deras informationsmängd eller vad det är. Och där kan dom då gräva djupt ner i den här statistiken eller i alla siffrorna eller vad det nu är, budgetar eller vad det är. Att dom kan gräva hela på alla kostnader hela vägen men att dom kan få en sammanställd ekonomisk bit av hela bolaget för att se sin egen del i helheten kanske.	CR CC CC, CR, RI
84.	P	<b>Hur kan man bidra till att information som levereras till användaren är relevant? För det har ju också lite med det här att göra . Hur arbetar ni med det?</b>	



85.	T	Ja alltså det är viktigt att kunna filtrera informationen. För informationsmängden blir oerhört stor desto större företaget blir. Och man får ju informationsinfarkt om man inte sorterar och filtrerar och då är gället det att filtrera och sortera bort rätt saker och att behålla det som är relevant. Men hur man ser till att göra det...det känns som användaren själv borde få välja de kriterierna, vad det är som är relevant. För det kan vara olika vad som är relevant i olika situationer och för olika människor. Så att man själv får lov att sätta upp någon sorts filter för vad det är man brukar vilja se men att man har full koll på filtret så man kan plocka bort och man kan se andra saker om man vill. Men att det är så här jag brukar vilja se det.	R, RI, CA CA  CR  CR  RI
86.	P	<b>Är det någonting du ser att ni jobbar med aktivt idag?</b>	
87.	T	ja delvis är det. Delvis realiserar vi filter men pratar väldigt tekniskt så hade man velat spara från en session till en annan och det kan vi inte göra just nu. Men det är sådant som vi pratar om. Jag tror också ett problem vi har i Evolver är att där visas all information och för vissa användare blir det för mycket och vi ser det hos vissa kunder att dom backar nästan för att det kan bli jättekompext. Och då vill man kanske från en annan applikation där man bara visar en viss vy in, att det är det du jobbar med. Men sen kan du välja att se mer om du vill, men du börjat med det här så att du snarare får lov att kryssa i om du vill se mer information. För om man gör på andra hållet att du måste skala av information så tror jag att man blir förvirrad från början. Det är bättre att man har det väldigt enkelt från början och sen att det uppenbart hur man gör för att lägga till och se fler dimensioner på saker och ting.	RI, CR  CA, CR, RE, RCR  CA, RE, RCR  RE, RI, R  RE
88.	CJ	<b>Så det är viktigt för er att ge både en helhet och transparens men också kunna erbjuda nån form av filtrering samtidigt som den är fullständig?</b>	
89.	T	Exakt men filtreringen måste vara uppenbar. Den måste vara transparent för användaren så att användaren inser att, för det första någonting är filtrerat så att man inte tror att man tittar på hela mängden trots att man bara ser en del av den. Och hur man kan göra för att få bort filter och se mer data.	RE, RI, RCR (OR)
90.	T	Sen är det då samtidigt viktigt att kunna se vad som är fullständigt, nu visas allt och nu är det begränsat. Så kanske man har en procentsiffra eller liknande. Vilka dimensioner som är bortsorterade.	CC, CR, RCR, (OR), RE, RI
91.	P	<b>Då kommer vi in lite på värdefull information. Hur blir information värdefull? Vad tycker du inbegriper värdefull information?</b>	
92.	T	För att vara värdefull måste den först och främst vara relevant. Det måste vara den informationen jag vill se för det första. För det andra måste den vara korrekt och som är den senaste versionen. Och för det tredje då inte bara att den är korrekt utan att man inser hur stor del av informationen man tittar på och hur mycket man har filtrerat bort. ... (reflekterande paus)...Så att man kan lita på den, då blir den relevant.	CR IA, CT  CR, CC, RI  RE, CR
93.	CJ	<b>Tycker du på något sätt utöver det här då på nåt sätt kan höja värdet på information ytterligare på något sätt. Att 1+1 inte blir 2 utan 3 eller att helheten ger mer än delmängderna. Finns det något ytterligare? För annats så det här med relevant, korrekt, helhet då är det ju ändå information som existerar i det formatet som det är. Tror du man kan erbjuda något mer för att öka värdet ytterligare genom i ett BI system?</b>	

94.	T	Ja det skulle kanske kunna vara förslag på slutsatser eller att visa samband. Det är ju det rapporter gör, dom visar ju en del samband. Men om man har någon form av intelligent sambandsmotor. Om vi har hela informationsmängden på ett ställe där den pekar rätt osv så skulle det kanske finnas en motor som föreslår: Kolla här allting som ni säljer i Turkiet är rosa. Saker som man kanske inte ser om man inte har en hypotes och stället en fråga och tar ut en rapport så ser man inte det. Att man har en sort motor som letar samband.	CV, C  RI, CV
95.	CJ	<b>Är det något ni jobbar med också?</b>	
96.	T	Nä, men nu fick jag ju tankar kring det, det låter väldigt intressant. Men nä det har vi inte.	CV och det ovan.
97.	P	<b>Då kommer vi in på uppdateringar och hur håller man då information uppdaterad?</b>	
98.	CJ	<b>För vi har ju egentligen vart inne på att det är viktigt men kanske inte på hur man gör för att hålla informationen uppdaterad!</b>	C?
99.	T	Man måste ju en organisation kring informationen för att hålla den uppdaterad. Det måste ju vara någon som är ansvarig för informationen och om det är en del av en organisation typ en avdelning eller en grupp så är det ok så länge man har en ansvarig utgivare det måste ju vara avgörande att någon har ansvaret för att den är uppdaterad.	IA?  CT
100.	T	Men sen, rutiner är ju jätte viktiga att man har rutiner för saker och ting så det inte bara är så att man uppdaterar den när man har tid eller uppdaterar den när man tycker det har hänt någonting utan man inför det som en rutin att en gång i veckan och vi skriver ut nyheter på internet en gång i veckan eller vi skriver in våra kostnader en gång i månaden Va var frågan igen?	OC – UC - rutiner
101.	P	<b>Hur man gör för att hålla informationen uppdaterad och det va ju bra det du va inne på, men finns det något sätt man kan stödja det i systemet då?</b>	
102.		Ja det skulle man ju kunna tänka sig. Det är ingenting jag har någon erfarenhet av men det hade ju vart bra. Det skulle i såna fall vara att sätta upp rutiner, alltså digitala rutiner kring information som då säger att man sätter upp en rutin som inte bara är presenterad i någon power point presentation som alla ska följa utan man digitalt matar in en regel så att den ska uppdateras en gång i veckan eller en gång i månaden eller något sånt och att man utifrån de reglerna kan man generera mail eller dialogger till användare som loggar in så man hela tiden säkerställer att informationen är korrekt enligt dem reglerna som man just det företaget har.	?
103.	P	<b>Har du något bra exempel på en sådan implementering som ni har idag?</b>	
104.	T	Nej tyvärr det har jag inte...	
105.		<b>PAUS</b>	
106.	P	<b>Vi pratade lite om att hålla information uppdaterad och hur man gör det, hur kan man göra så att informationen som efterfrågas, när användaren vill ha den, kommer inom den tidsram som man vill ha den, vi kanske har berört det lite innan att man kanske behöver den nu och inte om två dagar. Hur realiserar man det i systemet?</b>	CT
107.	T	Ja det är jätte intressant därför att eee en del av det vi jobbar med är ju att översätta humankapital till strukturkapital alltså plocka ut all den informationen som sitter i folks huvuden och sätta in i ett system där det är uppenbart hur det hänger ihopp för att man blir mindre beroende av nyckelpersoner inom företaget för det tror jag är ett jätte stort problem idag och då har man ju en annan tillgänglighet än när man är beroende av	AA

		att fråga människor: hur hänger det här ihopp egentligen? Hur ser vår produktmodell ut, hur ligger vår success rate i förhållande till det... så att ....att omvandla till ett hållbart struktur kapital som kan tillåtas att växa och förändra hela tiden är ju ett sätt att ge alla access till information när dem behöver det. Och då behöver man egentligen, alla behöver tillgång till det här systemet eller den här informationen där man får ändra, det är ju en rättighetsfråga ifrån företagets perspektiv, där man kan köra detta i realtid få ut den informationen som man behöver då utan att generera massa rapporter osv och man kan klicka runt och köra det direkt.	AAC CT
108.	P	<b>Så man försöker att se till att alla viktig information redan finns i systemet.</b>	AA
109.	T	Ja för det blir mycket lättare för nya människor att sätta sig in i information om man kan se hur allt sitter ihopp och göra analyser av det istället för att gå runt och prata med massa människor hela tiden.	AA
110.	P	<b>Sen kommer vi in på om det finns några problem med mängden information som produceras även i BI systemen?</b>	CA
111.	T	Ja det finns det, och då har jag ett exempel på en kund där vi har lagt in hela deras produkt model och den är extremt avancerad och dem har flera hundra tusen produkter liksom och dem ryggas liksom till och säger det här ju jätte komplext, det här är ju jätte mycket, hur vet vi var saker och ting ligger osv. Och där är det ju oerhört viktigt att kunna välja att se delar av informationen och då va vi ju lite innan på att man inser att det är en filtrerad informationsmängd där man på något sätt kan gå in och specia vad vill jag titta på idag och så går man in o klickar lite och så får man bara den mängden och när man har den mängden så kan man klicka i och då få se andra saker också.	CA? CR
112.	T	Men man kan definitivt få informationsinfarkt, men ett sätt att undvika det är ju att, att visa hur all information hänger ihopp så den blir logisk för om informationen är presenterad i ett system på ungefär samma sätt som man ungefär tänker på den i huvudet, som den gemensamma mängden arbetare tänker på den i huvudet, hur det sitter ihopp så blir det ju lättare att förstå den och undvika informationsinfarkt. Men är den representerad på ett helt annat sätt än hur det ser ut i huvet på användaren så tror jag man backar och orkar liksom inte ens börja titta på den för man inser att man inte är intresserad av hälften ens.	RI
113.	P	<b>Hur arbetar man så att användaren får den data som situationen kräver?</b>	
114.	T	Att man kan sitta på möten och plocka fram informationen snabbt att man slipper fördefiniera rapporter och sätta ihopp material utan jag tror det är superviktigt att köra det i real tid och filtrera utifrån det som är viktigt just nu.	CT CR
115.	P	<b>Jag tänkte också på det att det om det finns något sätt att hålla nere produktionen på information? Och förhindra överproduktion?</b>	CA
116.	T	Du menar hur systemen kan hålla nere produktionen?	
117.	P	<b>Ja jag tänker t.ex. att om man har ett fällt där man kan fylla i hur mycket information som helst så kan en person som har svårt att kortfatta sig trycka in för mycket.</b>	CA
118.	Cj	<b>Även organisatoriska faktorer kan ju vara viktiga vid data produktion.</b>	
119.	T	Ja man har ju suttigt i organisationer där folk är så fruktansvärt produktiva med sina dokument, dem skriver dokument efter dokument efter dokument och dem har ingen apparat runt omkring dem som kan ta hand om all den information som kommer ut och då handlar det ju, och det är ju också essensen av det vi gör, om ett strukturerat sätt att få	

		ut informationen för då kan själv välja vad som är relevant och inte relevant. Men om du har en rapport på 30 sidor så är det svårt att veta hur många procent av den som är relevant för dig men du måste likväl läsa igenom hela för att få reda på vad som var relevant för dig medans om du har informationen strukturerad styp som vi visade i evolver att du har olika entiteter och ser alla dessa relationer så kan du välja ok jag inte är intresserad av att veta vilka dokument han har skrivit utan endast vilka maskiner han kan jobba på. Och då kan jag välja att bara titta på den biten eee så att en strukturerad informationsmängd till skillnad från fritext informationsmängder är ett ypperligt sätt att se till att det inte blir en överproduktion av information.	CR CA
120.	P	<b>Nu är vi inne på hur informationen representeras och visualiseras för användaren.</b>	
121.	P	<b>Gör ni något för att öka användarens möjligheter att förstå och tolka informationen?</b>	
122.	T	Ja det gör vi ju, vi har någon form av, va som vi implementerat e någon form av graf som egentligen visar samma sak som navigatören men den visar det på ett annat sätt. För några tycker att navigatören är svår och tycker det är lättare att förstå grafer liksom. Så det har vi men det är rätt så futtigt i sammanhanget kan jag tycka eee möjligheterna som finns som 3d och man ser futuristiska filmer där man ser stora displayer och man flyttar med händer och då får man ju massa ideer om vad man skulle kunna göra och det finns ju faktiskt företag som tar fram sådana här skärmar nu som vi börjar samarbeta lite med för vi vill ju det...jag pratade lite om det att informationen är representerad så som man tänker på informationen förr då är den lättare att ta den till sig. Och då gäller det ju att man jobbar med informationen också och letar upp och filterar informationen och göra det.... man pratar om användarvänlighet i system när man får ut det på stor skärm och man kan peka o dra och leta vidare och zooma in och zooma ut och att man kan jobba med hela kroppen tror jag är viktigt, med händerna och så, både för att komma ihåg men även för att fatta informationen.	RCR?? CR RI?
123.	T	Visualiseringstekniken och det här att man kan interagera med den och flytta runt på saker och dra och släpp och mycket sånt men även att man kan göra ... jag menar olika människor trigger på olika saker och vissa trigger på rapporter och vissa på annat så att alla möjligheter finns där. Och sen det här ha begäret tror jag jätte mycket på, den ända anledningen att jag har en sån här tex. (Apple Iphone) Och då menar jag inte bara gadget utan har begäret och inpackningen av informationen. Om det är snyggt och man får en bra känsla som när man jobbar i mac OS tex det gör mig glad. Sitter man på en pc så blir jag skit irriterad på alla möjliga olika saker för jag tror det är viktigt ...den känslan som man ger när användaren arbetar med systemet. Har jag svävat ut fullständigt nu?	OR
124.	P	<b>Nej nej, det är jätte intressant, men det är ju också det att man försöker göra det så verkligt som möjligt. Men hur gör ni när ni kommer ut i företag... jag kan tänka mig att olika organisationer har olika logik i hur det fungerar, anpassar ni efter det något.</b>	
125.	T	Ja systemet ser ju ut så att det vi stoppar in är det som verksamheten levererar till oss. Vi går ju inte in och lägger några aspekter på saker och ting hänger ihopp utan vi försöker lyfta dem då så dem får ett annat perspektiv mer generellt så man inte läser in sig i så som det ser ut så man inte kan förändras med saker och ting ... men informationen som kommer från verksamheten och går in i systemet ser ut så som verksamheten säger att den ska se ut. Och eftersom systemet är så generellt att det klarar vilken organisation som helst så har varje organisation också möjligheten att stoppa in den på sitt sätt. Så den ser ut	IRR?

		så som dem menar att den ser ut.	
126.	P	<b>Cj: Jag tänkte på det när vi pratar om anpassa då men hur ser det ut i relationen till att man återger informationen på ett konsekvent vis? Finns det någon balansgång mellan att anpassa och ge en konsekvent bild och hur viktigt är det att det är konsekvent över olika användare?</b>	RCTR
127.	T	Ja det där är ju intressant för när dem kommunicerar mänskorna mellan vill dem ju kunna kommunicera i samma termer och samma språk även fast dem ser saker å ting olika i systemet. Och det är väll alltid en balansgång att gå tror jag men jag tror inte lösningen är att alla ska se det på samma sätt för att få konsekvens utan det är lite som man jämför det med en PC där man kan välja om man vill se kontrollpanelen i klassisk vy eller den nya vyn, och om man då är van att se det på sitt sätt och så ska man hjälpa någon annan så har dem det på ett annats sätt så blir man lite förvirrad kanske samtidigt hade vi diskuterat det utan att titta på skärmen skulle vi kunnat komma överens även fast han har en klassiks vy och jag har en annan vy för vi vet ändå vad vi pratar om liksom så jag tror att det bästa är att ge användare möjlighet att se det på det sättet som dem föredrar men att man har ett visst antal fördefinierade vyer fast som kan anpassas till en viss grad så man kan välja att se det på ett sätt som man snabbast fattar. Det tror jag är jätte viktigt för vi är olika för vissa är visuella, vissa är augmentativa coh vissa måste röra och skriva för att förstå så jag tror att eee att anpassa det till olika typer av mänskors sätt att förstå information är viktigt.	RCTR RE+RI
128.	T	Jag kan ju inte skryta om att vi har det så himla mycket i evolver för vi har kanske bara 2-3 olika vyer för det är helt klart underprioriterat men det kanske e sånt som kommer så småningom när det blir större.	IRR
129.	P	<b>Det kanske finns i andra system?</b>	
130.	T	Mmm fast jag tror inte....jag tror många system är rigida i det att dem visar saker och ting på ett visst sätt och dem kan inte visa saker på ett annat sätt utan man antar liksom att...man utgår väldigt ofta när man designar ett system så utgår man väldigt ofta ok va är det för målgrupp ok antingen är man nybörjare eller så har man jobbat några år eller så är man avancerad användare och då kan man väl att anpassa systemet i bästa fall efter hur länge man har jobbat med det och jag tror inte det räcker för även någon som har jobbat med det i tio år har olika sätt att lätt uppfatta information att vissa förstår en graf bättre än vad dem förstår ett träd och då spelar det inte så stor roll hur länge dem har jobbat med det ...det är klart det är en intressant faktor hur länge dem har jobbat med det men det finns andra faktorer och det tror jag är extremt få system som tar hänsyn till utan jag tror mer att man tar hänsyn om man är nybörjare eller man liksom..när man har jobbat med det i många år kan man välja att man får fler matriser.	RE
131.	P	<b>Är det någonting som du känner att inte har diskuterat när det kommer till informations kvalitet?</b>	
132.	T	En aspekt är ju det här att man ser till att göra saker på samma sätt eee det har ju också med informationskvalitet att göra som jag vet en del kunder nu som man har, man lägger upp en struktur ...för det första bara vilka termer man använder om man har en tendens att förkorta saker och ting när dem skriver in det i systemet medans vissa skriver hela namn och att man har mönster till hur man lägger upp saker och ting. Ok om vi lägger upp ett datum så ska vi göra så här eller om vi lägger in en ny variable är det det här och det här som gäller.	IO
133.		Det här är det mönstret vi använder och det är så här vi namger saker och ting för att man ska förstå det för när det är sån infomration som ska täcka hela företaget är det så himla många människor som hjälper till att skriva in det och då måste man ha regler att man stoppar in det på	IO

		liknande sätt kanske.	
134.	T	Och en fråga skulle ju då kunna vara: hur kan man befrämja att den informationen som går in i det här BI systemet, för det har ju lite det med subjektivitet och objektivt men inte bara det utan att man gör det på samma sätt.	
135.		<b>Per: Så att man är konsekvent är kanske viktigare när man lägger in det och när man återger det så kan man va lite inkonsekvent?</b>	
136.	T	Nja man kan anpassa det och visa det på olika sätt och dels på olika vyer. Men att det är extremt viktigt, för att rapporterna eller matirserna kan ju inte bli bättre än den information som man stoppar in och det är därför så många har problem med SOA lösningar och sånt för att dem har massa olika system och så har dem en produktmodell i 4-5 olika system och den produktmodellen ser helt olika ut i systemen och även om dem kommunicerar med varandra så pratar dem inte riktigt om samma sak och då är det ju jätte svårt att dra några slutsatser på saker och ting. Så det är extremt viktigt att man har regler kring hur man, och är konsekvent i hur man stoppar in information, på vilket sätt gör vi det.	IO
137.	T	En annan fråga som är rätt intressant som vi tampas med jätte mycket är att stora bolag har ofta sin egen it avdelning eller kanske eget it bolag om de är väldigt stora och ofta är det så när It ska utveckla system så är dem rädda för verksamheten, vet inte varför och verksamheten är trötta på IT för dem inte ger vad dem vill ha och IT är rätt så restriktiva på att gå ut i verksamheten och verkligen låta dem bestämma vad det är dem ska ha och det skapar en avgrund emellan dem och när vi går ut och jobbar så försöker vi bara jobba med verksamheten just för dem verkar inte ha förtroende för IT eller dem tycker inte att IT verkar ha något att bidra med och jag vet inte om det är ett intressant perspektiv för det säger ju en del om kvaliteten, för det är ju verksamheten som ska använda detta för att dra slutsatser sen och det är ju verksamheten som använder informationen i systemen och då är det ju intressant att veta var ursprunget kommer från och vad som ska bestämma vad som ska finnas i systemet, att verksamheten är mycket mer involverad än vad den är.	IR IB
138.	Cj	<b>Detta är ju ett adresserat problem som vi läst om som har med förtroende frågan att göra för det har, om jag förstår dig rätt så menar du dels hur man kan lita på den som skapat informationen?</b>	IR
139.	T	Ja också så hade vi tex. eeeee vi jobbade med en, ska inte nämna namn, som jobbade med att ge vård och då finns det sådana här nationella register som vill veta hur många som har fått hjärtinfarkt, hur många som fick hjärtinfarkt fick den här medicinen, hur hjälpte det? Hur många dagar va det tills dem blev utskrivna osv. Dem har nationell statistik för den typen av grejer. För att veta vad dem ska sätta ut för riktlinjer men också för att veta hur värden ska förbättras osv. Och där hade man problemet med att det var så mycket information i det här systemet när dem skulle skriva in vad dem hade haft för patienter som kommit in med hjärtinfarkt och vad dem hade gett för mediciner osv och så många paramterar som dem va tvungna att fylla i som dem inte hade användning av, tyckte dem, därför att när det här skickades iväg till dem här nationella registerna så tog det ett halvår innan rapporten kom tillbaka, vilket innebar, och även hur det ser ut i den regionen, så dem fick inte feedback på det dem hade stoppat in tillräckligt snabbt för att förstå att det är viktigt.	Förstå helheten och nyttan av sin lilla del
140.	T	Hade dem fått feedbacken en gång i veckan eller så att opps nu ligger ni lite efter nationalsnittet här, ni har patienterna inlagda tre dagar längre än vad snittet är, det här får ni jobba med, eller använda den här medicinen, hade dem fått det så hade dem fyllt i informationen tydligare om man fattar vad den används till och det är ju en förtroende fråga för: detta ska in i något register det skiter vi i .... men även om det är någon annan som	IRR? Data

		använder informationen att man får feedback på det så man ser att det faktiskt ger någonting det man fyller i.	Producers? CV –Value
141.	<b>P</b>	<b>På något sätt visa hur informationen skapar värde för dem?</b>	
142.	<b>T</b>	Exakt både hur informationen skapar värde nationellt men även för att skapa värde för den egna, och det är lite det vi va inne det vi pratade om förut hur den egna avdelningen förstår sitt värde i helheten, för annars sitter man bara o kör sin grej o skiter i vad dem andra gör. Vilket gör att när man kanske initierar projekt eller man kanske gör kostnadsbesparingar på en avdelningen för den avdelningen men dem kostnadsbesparingarna innebär då att dem får då jobba dubbelt så hårt så den totala kostnaden i slutändan blir mer om man inte hade dragit ner. Men man har inte den transparansen för alla är så fokuserade på det man gör så det är ju viktigt att man får helhetsperspektiv på det man gör	CV
143.	<b>CJ:</b>	<b>Ja då har vi ju täckt hur man jobbar för att få fram förtroende också vilket ni hade svårt att svara på förut så det är ju kanon.</b>	
144.		<b>Något annat du reflekterar över. ?</b>	
145.		Nja jag har en massa tankar som flyger runt men kanske inte runt informationskvalitet.	
146.	<b>Per</b>	<b>Ja men vi följer upp detta om vi undrar något mer per mail</b>	

## ***Interview C – follow up email with Mr Dageson***

### **Our question:**

*...Vi har dock en fråga vi känner att vi inte fått svar på när det kommer till en dimension av informationskvalitet.*

*Vi undrar nämligen hur ni ser på hur vida det är viktigt att hålla information kortfattad både när den representeras i systemet samt presenteras för användaren och hur kan man jobba med denna aspekt?*

### **Answer:**

Jag tycker inte att det finns något självändamål i att informationen är kortfattad. Samtidigt finns där ingen anledning att visa mer information än situationen kräver. Så kortfattad eller ej – situationsanpassad är nyckeln. Eftersom den lagrade informationen oftast skall kunna stödja en mängd olika intressenter med olika vyer så är den mer omfattande i sin helhet. Det är viktigt att informationen är väl definierad och entydigt kan tolkas av alla användare.

Där finns många försök att bygga upp kodsystém för att exempelvis kunna klassificera sina produkter. De ger ofta ett bra stöd för minnet och ett sätt att effektivt kommunicera kortfattat. Detta har gett system där det varit möjligt att mycket kortfattat kunna beskriva produkter på ett koncist sätt vilket medfört snabb igenkänning för de som kunnat kodsystémet. Många av dessa kodsystém är utvecklade innan datorer fanns eller när de hade ytterst begränsad minneskapacitet. Därför faller de ofta i takt med att exempelvis produktutbudet växer. Nu krävs det mer sofistikerade kodsystém som innehåller än mer information än vad som tidigare varit möjligt och som klarar av förändring på ett mycket bättre sätt. Det handlar snarare om att kunna se mönster av samband. Eftersom det skrivna och talade språket inte är tillräckligt kraftfullt för att uttrycka alla företeelser i verkligheten blir dessa mönster av väl definierade ”informationbyggblock” allt viktigare. Detta ger möjligheter att se mycket mer information med allt mer kompakt symbolik. I den meningen är det viktigt att information är kortfattad. (Ett mönster säger mer än 1000 ord!)

Ett annat sätt att betrakta kortfattad information är att visa det som verkligen är viktigt. I ett system för styrning och kontroll kan det vara viktigt att bara visa det som avviker ifrån det normala. En stridspilot behöver inte hela tiden fokusera på alla instrument som visar att allt är normalt... Det är dock viktigt att kunna gå ifrån kortfattad information till en mer utförlig beskrivning.

Generellt så är information som hanteras i verksamheter idag inte tillräckligt kortfattad och koncis för att kunna skapa en effektiv kunskapsförädling. Informationen är alltför ofta svårtolkad på grund av tvetydighet och icke

hållbara definitioner. Journalhantering inom vården är ett typexempel på detta. Där kan utförliga operationsberättelser skrivas ned i överflödigt text utan att exempelvis viktiga detaljer om implantatets material kommer med. Sedan kan det vara bra att kunna komplettera strukturerad koncis och kortfattad information med textbeskrivningar för att komplettera det som måste kunna skrivas ”mellan raderna”.

Hoppas det gav något? Svaret varierar nog lite beroende på hur man definierar kortfattad



## Appendix D – Survey

### Introduction

This survey is used for a thesis on the information quality in so called Business Intelligence systems. BI systems or tools are often used to support decision-making and to enhance the control and information in the business operations. In this case we refer to systems that supports your decision-making for example in terms of gathering and presenting information from different sites of the company. We turn to you who use some kind of supporting IT for handling information. These IT-solutions can be everything from Excel/spread sheets-based solutions to more advanced and large decision support systems. Whether the decision-making is taking place on a high level or it is day-to-day decisions doesn't matter.

This survey consists of 29 questions that will approximately take 10 minutes to answer. We are very grateful for your time and answers and the result from this survey will be available to you. We hope and believe that our result will be able to contribute to how you view and manage the information resources you possess.

### Introductory questions

- The above description corresponds to my system and usage. Yes/No
- I use the following tool / solution: \_\_\_\_\_

### The Intrinsic dimensions

1. The information in my system is well corresponding with the reality.
2. The information in my system has the ability to change dynamically together with the reality.
3. I trust the information in my system.
4. I am able to tell from where the information that I use originates.
5. The information in my system is objective.
6. We have standardized routines for how to create information.
7. The information in my system has good reputation.

### Accessibility

8. The information I look for in my system is always accessible.
9. The information I need is sometimes impossible to access due to technical aspects.
10. The information I need is usually hard to access due to that it is not in one place and requires me to search for it in different places.
11. The access to the information in my system is secure.
12. Due to security policies/technologies I have problems accessing the information in my system.

### Contextual

13. The information in my system is relevant to me.
14. I have the ability to filter information in my system.

15. My system helps me to add value to the information by showing connections and relations in it.
16. The information delivered by my system is complete enough for the task at hand
17. The information in my system is up to date.
18. I receive the information I need when I need it.
19. Our organization has a person or department that is clearly responsible for information and information management.
20. The information in my system is too detailed.
21. The amount of information is a problem in my system.

### **The representational dimensions**

22. It is easy to interpret the information in my system.
23. My system provides me with good visualization of information.
24. The information in my system is easy to understand.
25. I can edit/change the way information is presented to me in my system.
26. The information in my system is represented in a concise way?
27. The system can help me insert information in a more concise way?
28. We have a common terminology in our company; we use the same notion to describe things.
29. The information in my system is presented in a consistent way.

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