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Adoption of Innovative Technology for Business Transformation with Big Data in an Oil and Gas Company in South Africa

A Case of a South African Oil and Gas Company

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Abstract

Today, it is a known fact that Big Data (BD) lead to a competitive advantage for organisations. While several methodologies have been introduced to gain insights using BD, there is a lack in research regarding the adoption and usage of this knowledge within organizations for effective decision-making. By analysing a case of a South African oil and gas company, results of current research of innovation adoption have been adapted in order to find the reasons for the problem and fill this gap in current research. To collect data for this thesis, eight managers have been interviewed. The findings have then been analysed and assigned to a set of categories.

The result of this research are three major criteria. Depending on the fulfilment or lack of the criteria, they act as enabler or barriers. The first criterion is the quality of the system, most important being data quality, next to performance and up-to-date data. Second is support and training, most important to find the right people for the right position and train them how to access the BD analytics and what is available. The right people have a passion for analysing data and bring with them creativity and innovativeness. The third influencer is (missing) features. It describes the possibilities to access information gained by BD. In the case of the oil and gas company, it was missing mobile reporting, predictive analytics and unstructured data. These three categories create a perceived value, which influences the adoption of BD analytics. The perceived value also effects the management, which themselves have been found as an influencer for the adoption.

Acknowledgements

While working on this research, I had the possibility to learn a lot and profit from the support and knowledge of different people, to whom I am very thankful.

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1. Introduction

Every day, every-one of us leaves behind a digital trail of data. Online retailers such as Amazon use this very data as a competitive advantage and put many traditional bookstores out of business. But not just in the virtual realm, also in real life we generate insightful data about ourselves without consciously realizing it. Today, also traditional retail stores make use of this data in order to gain a competitive advantage (McAfee & Brynjolfsson 2012).

Early Ackoff (1989) explained that data needs to be processed to information and in that process gains usefulness. While data describes characteristics of objects and events, information is more compact and answers simple questions. By further processing information to knowledge, it gains further usefulness and offers instructions and answers for more complex questions.

In South Africa, an oil and gas company attracts many customers on a daily basis. The company understands the value of the data about their customers and therefore started mining the very data. The data is collected and combined in reports that deliver further insights to the company. Most of the reports are targeted to the managers using the reports to make decisions as well as passing the reports on to other employees. Some managers use the reports successfully whilst others do not make use of them at all. This research investigates the adoption of knowledge gained by using Big Data (BD).

1.1 Problem Statement

Previous research efforts has been undertaken in the area of implementation of innovation, but has left out the reasons causing a lack of adaption of innovation in a frequent way within organizations (Park, S.Y.; Nam, M.; Cha 2012; Aldunate & Nussbaum 2013; Wisdom et al. 2014). BD has grown to an important field of research for various organizations (Constantiou & Kallinikos 2015). Existing research offers methods on implementing BD but there is a lack of research for considering the adoption of outputs from BD (Kwon et al. 2014; Riggins & Wamba 2015).

The issue with the usage of BD insights appears after the implementation of a solution for the individual who is supposed to use it (Wisdom et al. 2014). While BD can create a competitive advantage for organizations (McAfee & Brynjolfsson 2012), little attention has been given to the adoption factors of BD innovation (Riggins & Wamba 2015) which several organizations struggle with (Kwon et al. 2014).

Research has found that there are factors, like management support or result demonstrability, which determine if innovation gets used or not (Park, S.Y.; Nam, M.; Cha 2012). Those factors are found often on behavioral, organizational and business side (Riggins & Wamba 2015). While there are many adopted frameworks in order to find the causes of failed adoption, literature seems to have given very little attention to the adoption problems of the usage of BD knowledge transfer.

1.2 Thesis Definition

As illustrated in Figure 1, the topic of the research is knowledge management. Knowledge management includes all processes to use knowledge according to a goal of an organization in order to compete in the market and handle challenges of the environment (Greiner et al. 2007).

The research problem is that it is unclear how knowledge gained by BD is being transferred in an organization.

The aim of the study is to explore the factors and barriers for BD knowledge transfer.

This concludes in two research questions (RQ). RQ 1: **"What are the factors that affect the transfer of knowledge by employees who utilize the information created by BD analytics?"** Three supporting sub research questions (SRQ) are asked:

- SRQ 1.1 What knowledge is transferred between employees within the organization?
- SRQ 1.2 What does support the transfer of knowledge gained from BD analytics within an organization?
- SRQ 1.3 What are the challenges experienced in the transfer of knowledge within the organization?

The second research question (RQ2) is: "How can the knowledge created by BD analytics be transferred amongst employees?" and has two supporting SRQs:

- SRQ 2.1 How are the information and knowledge made available within an organization?
- SRQ 2.2 How is needed knowledge transferred within the organization?

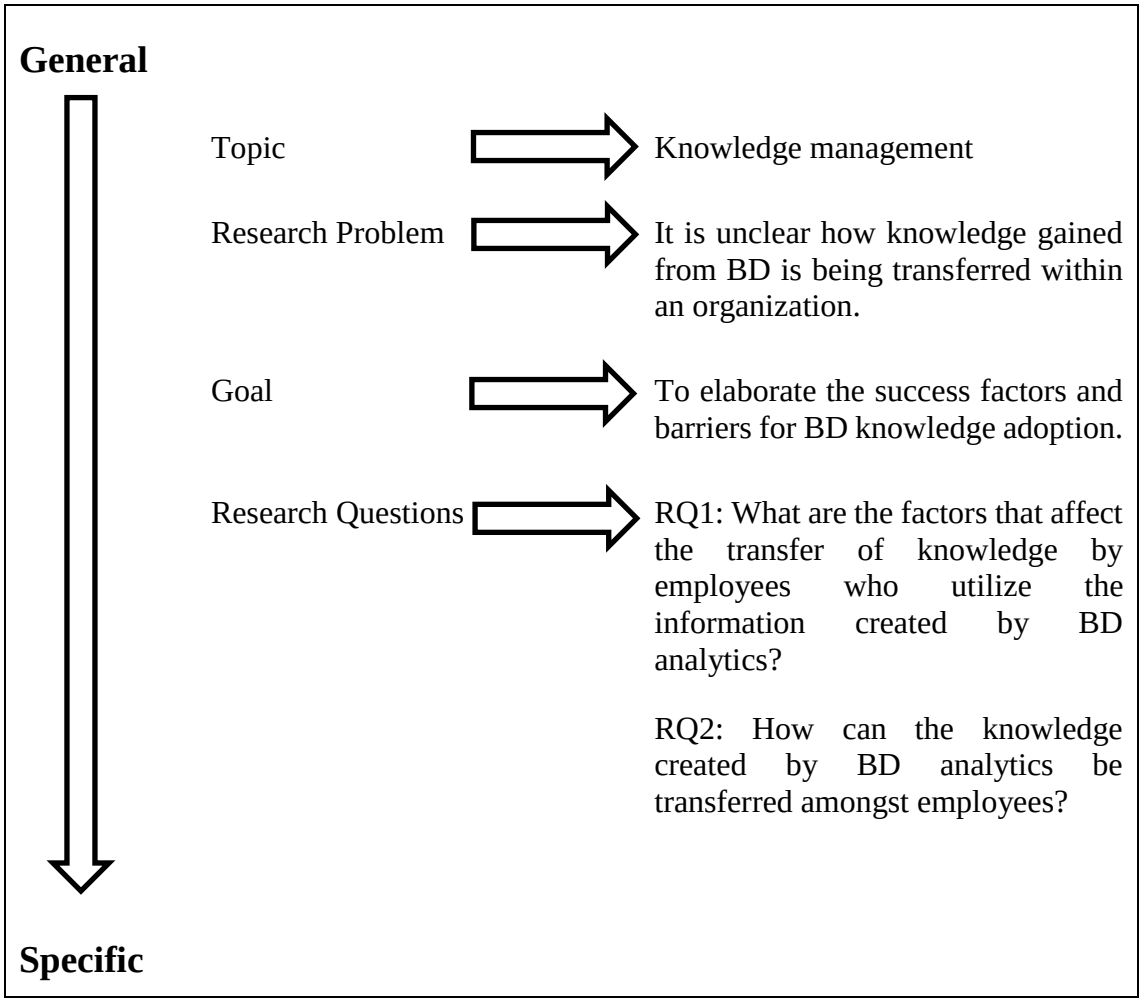

Figure 1: Topic, research problem, goal, and research questions (adapted from Ellis et al. (2008, p.21))

The case study was carried out in a South African oil and gas company which introduced data analysis in order to derive and share knowledge. Typically, the people who do the data analysis are not the same as those people who make the decisions based on the information gained from the analysis. In particular, in large enterprises, data analysts are in the headquarters while the knowledge affects the business in the subsidiaries. Thus, the knowledge has to be transferred to and shared with the people who have to make decisions

and act according to the insights gained from data analysis. For example, an oil and gas company with many stores at petrol stations has large volumes of data about their customers and sales from which knowledge about buying behavior can be derived.

Derived from the topic, research problem, goal, and research question the following thesis statement is defined:

> **"It is possible to identify and categorize the barriers and enablers for the transfer of knowledge gained by Big Data in an organization."**

After defining the focus of the work with the thesis statement, it also implies the limitations of the thesis. The focus is on knowledge transfer of BD in organizations. While the diffusion of new technology generally is a challenge in organizations this research is limited to those based on BD. Also the focus is on the transfer and usage. While knowledge management has to be seen with all the dependent building blocks, the focus is on transfer and usage. Interviews just take place in the headquarter of the company and not in the subsidiaries.

1.3 Chapter Overview

As illustrated in Figure 2, the paper follows a certain structure, defining the focus of the proposed theses, offering background information on current literature and explaining the methodology.

The start is an introduction giving background information, stating the problem and defining the thesis with the thesis statement and the research questions.

The second chapter gives a literature review, targeting the dependent topics that are Innovation and the Innovation process, BD, Knowledge Management, and last Innovation Adoption Framework and general information about innovation adoption. Some adoption frameworks are the Extended Technology Adoption Model (UTAUT), Technology Adoption Model (TAM) and Extended Technology Adoption Model (TAM2) models, which were frequently used in innovation adoption research.

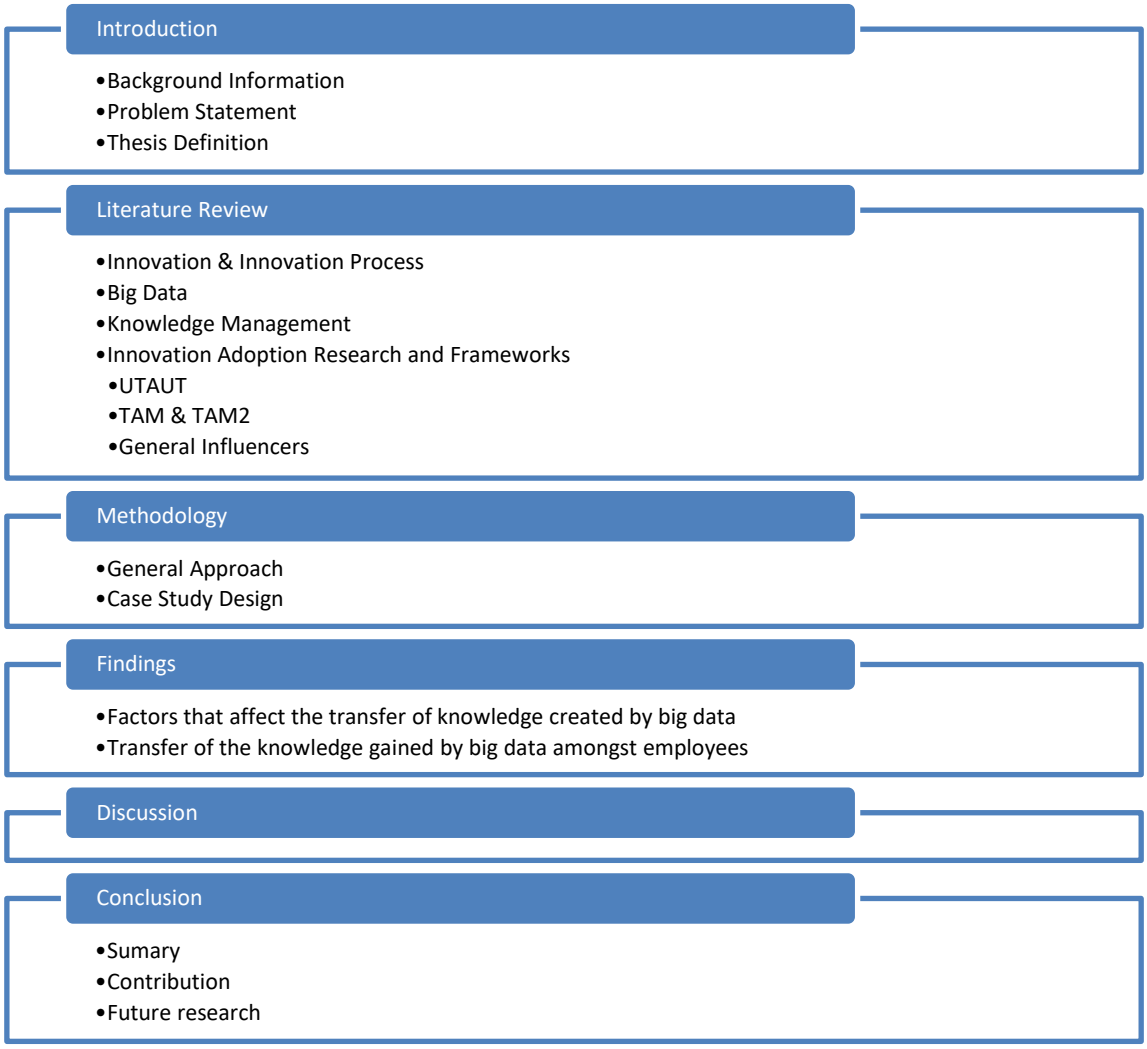

Figure 2: Chapter Overview

In the third chapter the methodology of the proposed research is explained. First the general research approach and in a second and larger part the case study approach with the detailed phases.

The fourth chapter presents the findings of the interviews. The structure is according the research, sub research, and interview questions.

The findings are discussed and supported by the literature in chapter five.

A short conclusion and summary is presented in chapter six.

2. Literature Review

The literature review aims to give an overview of knowledge transfer and adoption in order to contextualize the focus and methodology of the research.

The literature aims to explain the nature of new technologies in the chapter innovation and the process behind it. Since the knowledge transfer und adoption belong to the topic of knowledge management a short introduction explains the complexity and dependencies of it. The concept of BD is clarified in a short separate section as the focus is on knowledge based on BD. The last section of the literature research is devoted to the different innovation adoption frameworks and research. The general concept of the frameworks are explained and some of the more popular frameworks are highlighted. The frameworks are essential for this research since the aim is to find reasons why knowledge is not used successfully using this new BD technology.

2.1 Innovation

Rogers (2003) starts by showing examples of innovations that failed. Those innovations are rationally superior to the current solutions and would help individuals in their work or life but did not get accepted. But still, the importance of innovations cannot be denied. In order to develop and be competitive a company, or even a whole economy has to stay innovative (Tidd et al. 2001; Romih et al. 2015).

Innovation has been the focus of many different studies. The foundation of innovations are creative ideas. An organizational innovation is the successful implementation of those creative ideas. The creative idea and hence the innovation can be anything, from products, marketing concepts up to processes (Amabile 1988).

Further, Rogers (2003) describes that an innovation has to be new. The newness for an individual or organization depends on the perception. It can be completely new knowledge, or something known that someone neither has adopted nor rejected, yet.

An innovation in an organization can be caused by a managerial decision or influenced by external conditions. The innovation creates a change within the organization in order

to ensure an adaptive behavior and improves the level of performance or effectiveness (Damanpour & Schneider 2006).

In their paper, Wisdom et al. (2014) state that there are many frameworks describing the process of implementation of innovations, but that there is a lack of information about why innovation does not get adopted.

2.2 Innovation Process

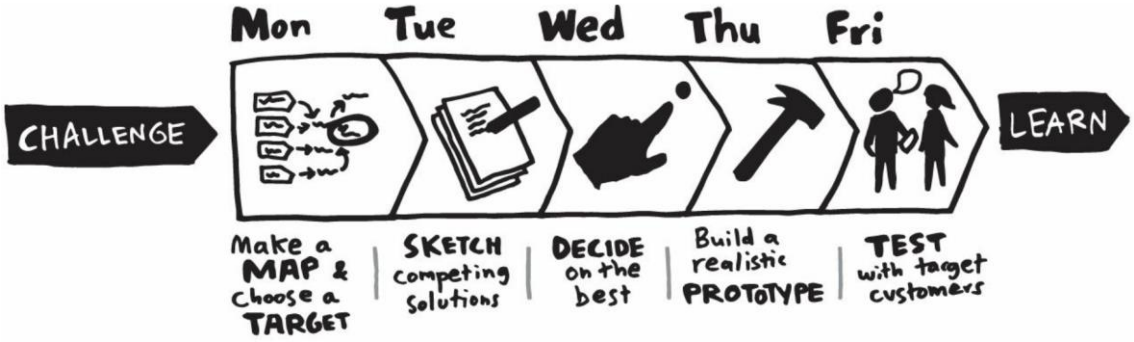

Figure 3: 5 Days Sprint Model (Knapp et al. 2016, p.38)

In a recent model Knapp et al. (2016) presents the innovation process in a sprint that lasts 5 days (Figure 3). The first day is about analyzing the problem, collects data and chooses the focus. The next day different drafts on solutions for the problem are created. The third day is spent with deciding for a solution which will be created as a prototype the following day. The last day is used to gain experience on field tests, evaluating the prototype.

In a similar way but not within 5 days, Rogers (2003) describes the innovation process as well. Introducing an innovation can be described as a sequence of five stages and separated in two phases: the initiation phase and the implementation phase. The first phase is about information gathering, making concepts, planning the implementation and leading up to the decision to adopt. The second phase is all about the implementation of the innovation (Figure 4).

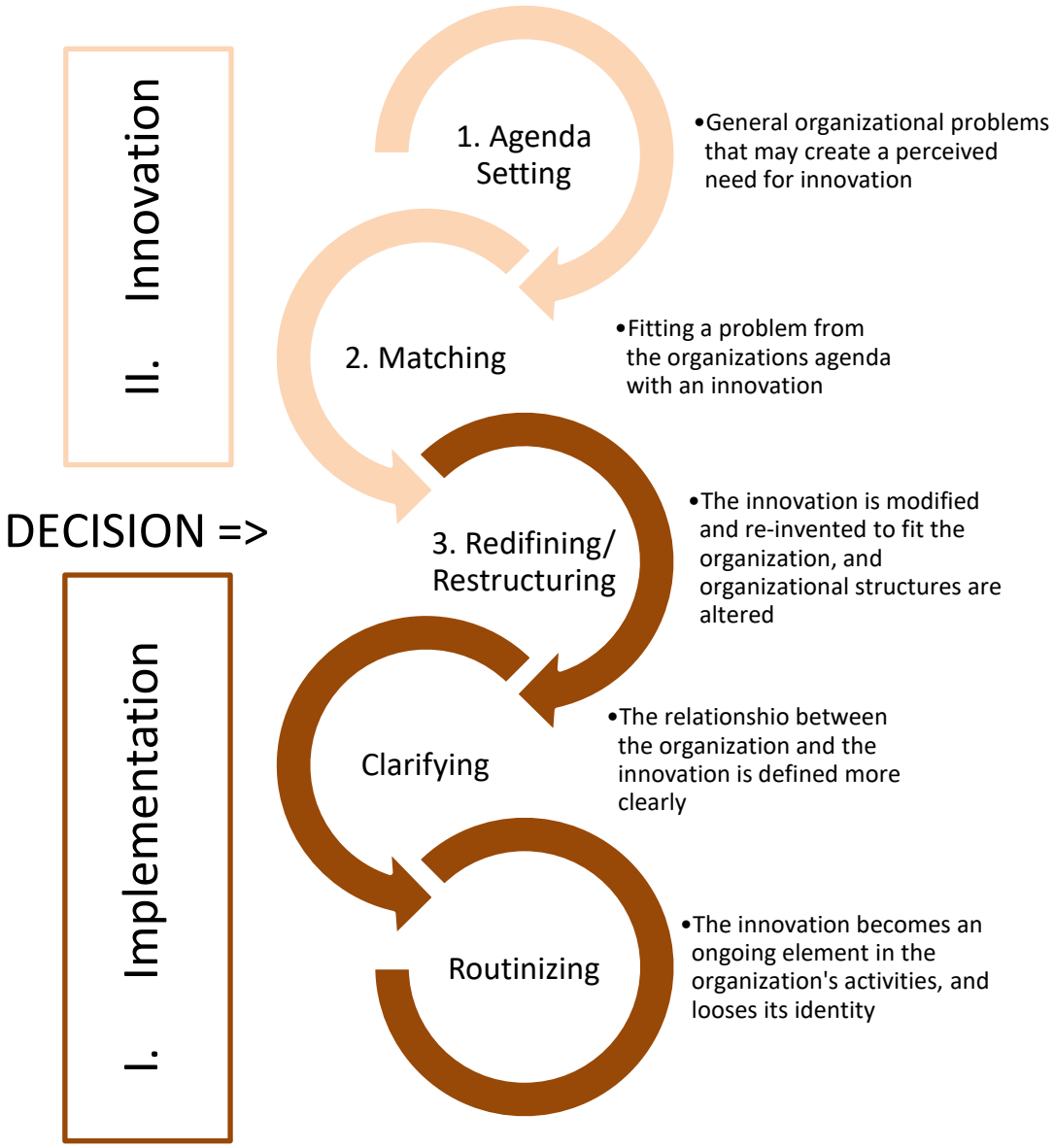

Figure 4: Five Stages in the Innovation Process in Organizations (Rogers 2003, p.165)

The five stages in the innovation process in organizations are described by Rogers (2003) as follows:

Agenda Setting is on the one hand about finding out the needs and problems of the organization and on the other hand finding solutions for those. Sometimes it also works the other way around, a new innovation gets known and triggers the need for it. Both ways lead to a perceived need for an innovation. At this stage data collection and analysis is important.

In the second phase of the process the matching is about verifying the fit of the innovation to the need or problem. This fit is also substantial for the later acceptance and long term

sustainability of the innovation. This phase also ends with the decision for or against the innovation.

The next phase of the implementation is all about importing the external innovation into the organization. The redefining / restructuring phase re-invents the innovation according to the organization's needs. This phase has a great impact on the organization because it is not necessarily just the innovation which needs to get adapted to the organization - it is also the organization which has to be adapted to fit the innovation. Depending on the disruption of the innovation it can trigger a high amount of uncertainty, which can rise a resistance against the technology.

The next step in the stages the innovation is put into extensive use within the organization. This means that more individuals are creating a common understanding of the innovation and defining for themselves how the innovation works and what the impact is. The outcome is usually a product of social interaction of the individuals within the organization.

Finally, in the last stage the innovation enters the phase of routinizing. The innovation now is merged within the organization and has lost its own identity. In a previous study, Hall et al. (1975) define a framework to assign eight different stages to an innovation. The stages range from where the user has little to no knowledge about the innovation until the rare stage where the user is revaluating the innovation and searches for ways to even improve the current usage. This represents the different stages within the adoption process.

This research is focused on the implementation phase of the innovation process according to Rogers (2003). While the problem and solution for it has been decided in the implementation phase, the solution has to be accepted and adopted in the implementation phase.

2.3 Big Data

Internet, social media, cloud computing, mobile devices - all create a large amount of data. The term BD increased in popularity in the last years. It is often defined by the

volume of the data but used in various ways (Hartmann et al. 2014). Halaweh and El Massry (2015) write that "big data describes the massive amount of data that can be processed and analyzed using technology to gain business values that will help organizations to achieve competitive advantages."

In general BD in literature is described by the 3Vs (Halaweh & El Massry 2015):

- Volume: The size of the data is huge and needs capacity and processing power
- Velocity: Data is created very fast and hence the processing speed and analyzing needs to be fast, too.
- Variety: Data is very different and exist in many different types.

IBM (2013) also added another V, for Veracity stating the uncertainty of data quality. Recently there were also other models emerging in media columns, adding more Vs to the BD definition (Liu et al. 2015). According to the media column (McNulty-Holmes 2014) those additional Vs are variability, meaning that the meaning of data can change, like words in context for example, or visualization, speaking of the challenge to visualize big data in the right way and finally value speaking about the possible savings or costs of BD.

Chen et al. (2012) include BD within the field of Business Intelligence, which delivers the tools to work with the data and create value for business.

2.4 Knowledge Management

Knowledge in an organization works in a cycle. According to Probst (1998) there are several building blocks in knowledge management(Figure 5) that are interdependent of each other. He suggests that no knowledge management activity should be executed without the context of the others.

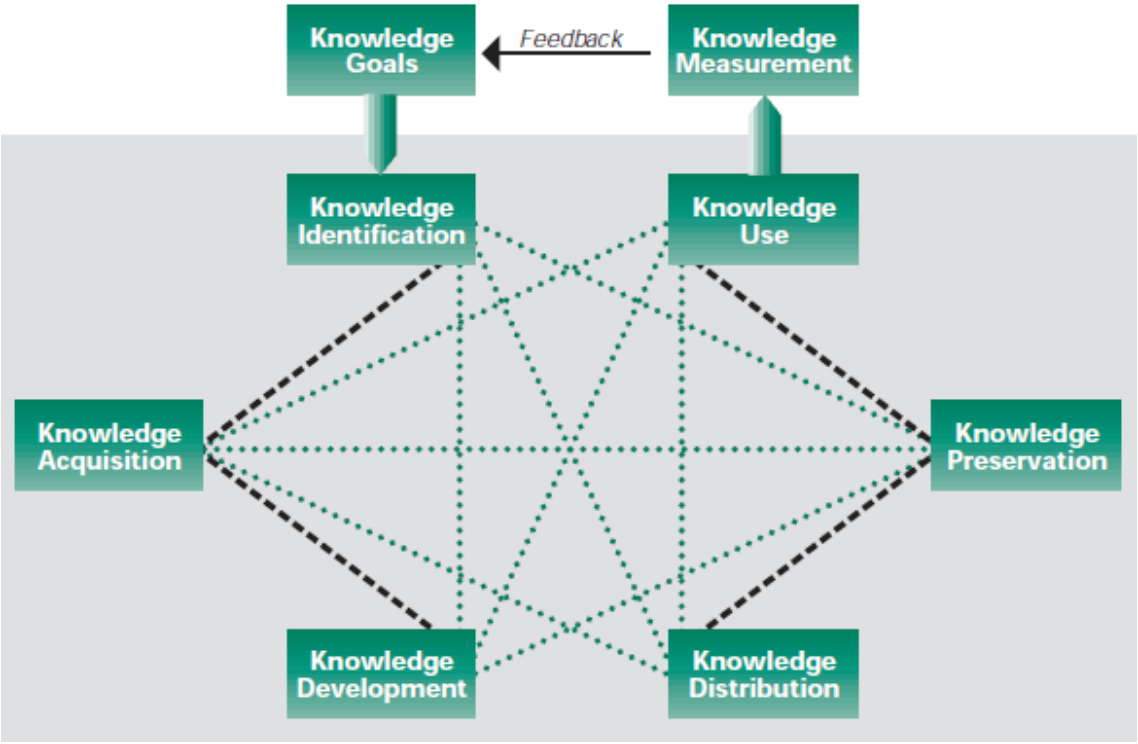

Figure 5: Knowledge Management Building Blocks by Probst (1998, p19)

All blocks are explained, including the important blocks for this proposal which are knowledge distribution and knowledge use (Probst 1998):

Knowledge goals give the direction for knowledge management. Probst (1998)separates between strategic and operational knowledge goals. The strategic goals give the direction and the future demands of the organization while the operative goals transform those strategic goals into action.

Identifying knowledge deals with the challenge of creating transparency about the knowledge of an organization. A big organization can easily loose track where knowledge is stored, be it in systems or individuals. Different solutions such as knowledge maps offer possibilities to create this transparency where knowledge is stored.

The knowledge acquisition faces the fact that it is for most organizations impossible to hold all necessary knowledge within the company in today's fast changing world. Hence knowledge needs to be gained by external sources. Probst (1998) here differentiates between different channels. Knowledge can be acquired by other companies (taking them over, creating joint ventures etc.), by involving stakeholders (e.g. involving customers in

the development phase), by hiring experts or by buying knowledge stored in products like software.

The building block knowledge development is about the management of producing new internal or external knowledge. The objective of this block is to support individuals as well as groups in the development process.

Knowledge distribution focusses on how to support the spreading of knowledge in an organization and also on who needs which information. A challenge is to find knowledge barriers that stop the knowledge from being spread.

After a new knowledge management system is installed there is still the challenge of knowledge usage. The new knowledge needs to be seen as an advantage from the individuals in order to be adopted and behavior to be changed.

The next building block is knowledge preservation. The developed or acquired knowledge needs to be stored and preserved. This block deals with the process of selecting the valuable knowledge which must be sorted.

Knowledge measurement is described as the most difficult part of knowledge management by Probst (1998). The task is to find ways or methods to measure the capabilities of knowledge.

Knowledge is created by BD and the problem is how to put it into use. As visualized by Probst (1998) knowledge use is linked to the whole knowledge management eco system. In order to implement a BD solution to sustainably transform and improve business all knowledge blocks have to be considered.

2.5 Innovation Adoption Research and Frameworks

Innovation adoption can be described as a process how an individual gets to know something new, deciding to buy it until making full use of it trying to use the full potential of the innovation (Renaud & Biljon 2008).

The adoption process is divided into pre and post adoption phases. In the pre adoption phase, the innovation has to be initiated, there has to be made a decision for the innovation and the innovation has to be adopted for the company and circumstances (Damanpour & Schneider 2006). The post adoption stages are divided into Acceptance, Routinization, Infusion and Extension, following an approach Saeed and Abdinnour (2013) did use. Acceptance is described as the general attitude towards the technology to be adopted. Routinization is the part where the individual gets used to the product and starts using it. In the Infusion stage, the individuals already integrated the technology into their daily work. By testing the limits and trying to find additional usage scenarios, the individual enters the Extension phase.

According to Jeyaraj et al. (2006) research has focused on a major research paradigm regarding innovation adoption. The paradigm states that individuals and organizations who possess the right independent variables are more likely to adopt new innovation (Figure 6).

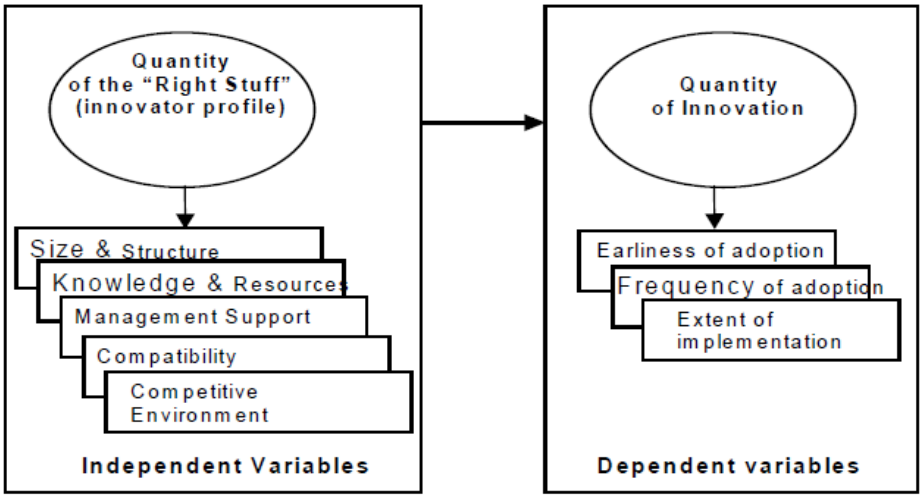

Figure 6: The paradigm of IT innovation (Fichman & Hill 2004, p317)

In conclusion, an organization with the right independent variables is supposed to innovate better and with less effort or can make a better use of the outcome of innovation. An organization that has the right independent variables may be said to fit the innovator profile (Fichman & Hill 2004).

Depending on those independent variables the depending variables are defined. Those dependent variables include e.g. the earliness of adoption, the extent of implementation, the routinization and the frequency of adoption (Fichman 2001).

The following subsection is about presenting several adoption frameworks explaining how adoption behavior can be influenced.

2.5.1 Individual Adoption Influencers

In their literature review, Jeyaraj et al. (2006) list influencers found as effective on innovation adoption. They differentiate between the adoption behavior of individuals and organizations. The reason for separating those two factors is that there are different variables that influence the adoption of innovation and different theories are created. While stating the separation of those factors, they also admit that there is an overlap between both and both kind of theories are often use to further improve other theories. Based on a literature review of 99 studies Jeyaraj et al. (2006) analyzed the influence of the single independent variables on the dependent variables.

Jeyaraj et al. (2006) found 67 independent individual variables. Those variables were analyzed regarding the number of times it was examined in studies and the number of times it was found significant for the adoption of innovation. The best independent variables were those that were regarded most often significant in relativity to total appearance in studies. Another weighting about the total amount of total appearances was done to ensure that no variables were chosen which were just mentioned in one paper.

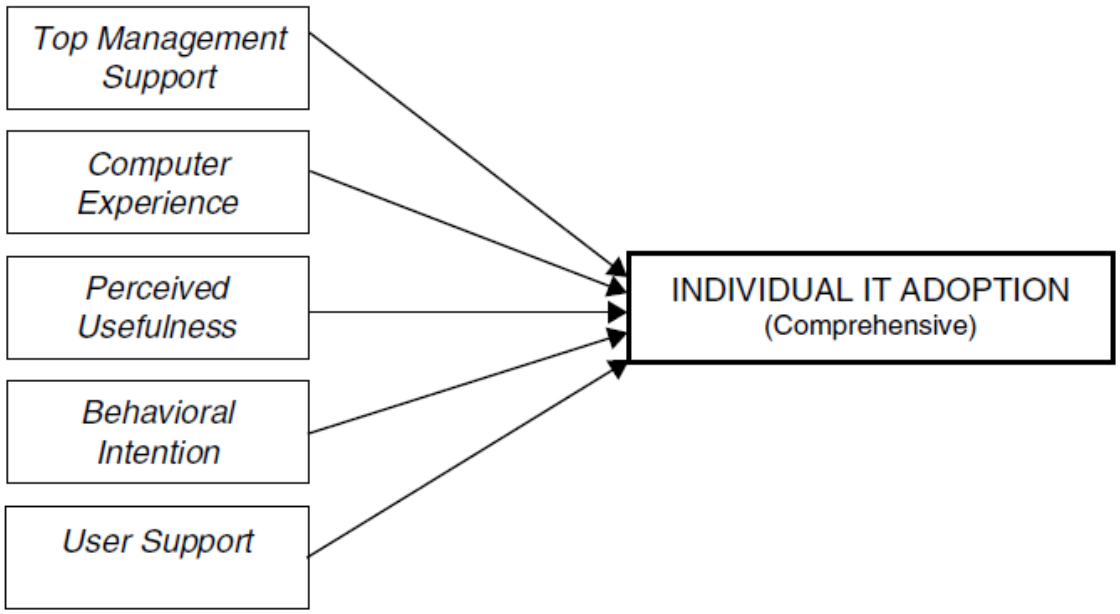

Figure 7: Most influencing independent variables for individual IT adoption (adapted from Jeyaraj et al. 2006, p7)

The most relevant individual variables were concluded (Figure 7), which are:

- Top Management Support: Support from top management for the innovation, the only independent variable which was evaluated as very influencing in individual adoption and organizational adoption (Jeyaraj et al. 2006).
- Computer Experience: Collected experience with computers by an individual.
- Perceived Usefulness: If an individual believes using a particular system improves the performance (Davis 1989).
- Behavioral Intention: The intention to use a system which then leads to action (Ajzen & Fishbein 1975).
- User support: By offering an user sufficient training and assistance when they encounter challenges with the system the chances of usages are improved (Thompson et al. 1991).

Further Jeyaraj et al. (2006) recommend promising variables which have just appeared between 3 or 4 times in their sources but have all times been valued as important. Those are System Quality, Professionalism of the Information Systems Unit and User Training.

2.5.2 Organizational Adoption Influencers

With the same procedure like explained in the previous section, Jeyaraj et al. (2006) also analyzed the organizational adoption variables. 100 variables have been examined in literature and described as significant influencers regarding organizational IT adoption.

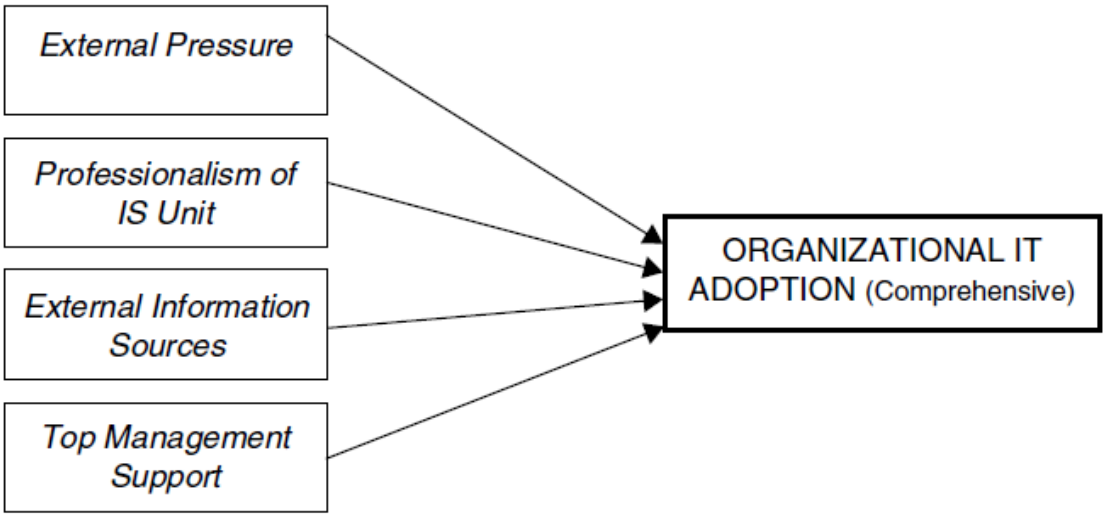

Figure 8: Best influencing independent variables for organizational IT adoption (adapted from Jeyaraj et al. 2006, p9)

The most relevant individual variables are (Figure 8):

- External Pressure: The external pressure from competitive partners can make operations and processes more efficient and effective (Cooper & Zmud 1990).
- Professionalism of IS Unit: Education and skill level and related knowledge of staff working in the information system unit.
- External Information Sources: Information coming from outside of the company, such as consultants, vendors, representatives, trade publications, reference books, and seminars
- Top Management Support: Support from top management for the innovation, the only independent variable which was evaluated as very influencing in individual adoption and organizational adoption.

Among the other variables, Jeyaraj et al. (2006) found 2 more promising variables which were mentioned three times but found each time as strong influencers. These variables are Environmental Instability and Top Management Characteristics.

In a similar fashion, Puklavec and Oliveira (2014) collected different adoption factors from literature and let experts rank them by importance. In difference to Jeyaraj et al. (2006), the focus is on reporting, one possibility to visualize BD. The results were the following (definitions are from Puklavec & Oliveira (2014) if not stated otherwise):

- **Expected Benefits** – The expected/ perceived benefit from the solution
- **Perception of Strategic Value** – Impact on how the reporting can help with strategic activities in the organisation
- **Costs**
- **Business Intelligence System is a part of ERP** – A reporting solution which is part of the ERP is supposed to be adopted faster and better within the organisation
- **Management support** – Support from management for the reporting solution
- **Organizational culture** – The grade to which a company's culture is open for new technological innovations (Gu et al. 2012)
- **Project champion** – Projects are supposed to have a higher success if an individual with innovation project experience is involved
- **Organizational data environment** – Reporting is highly dependent on good source data factors (e.g. quality and availability)
- **Size** – Bigger sized companies are more likely to adopt reporting (Buonanno et al. 2005)
- **External support** – Availability of external support for the implementation und application of the new solution

2.6 Innovation Acceptance Models

Opposed to innovation adoption the acceptance models are about the attitude of an individual towards a new technology. While acceptance cannot be described as adoption of technology, it can be said that without acceptance a true adoption will be difficult (Renaud & Biljon 2008).

The following two sections explain the three popular frameworks UTAU, TAM and TAM2 which is the extended version of TAM.

2.6.1 Framework UTAUT

In order to analyze technology adoption Venkatesh et al. (2003) compared eight different technology adoption models through the literature in order to create a combined model the Unified Theory of Acceptance and Use of Technology (UTAUT). The models compared included the Theory of Reasoned Action, the Technology Acceptance Model including the extension, the Motivation Model, the Theory of Planned Behaviour, and the Innovation Diffusion Theory.

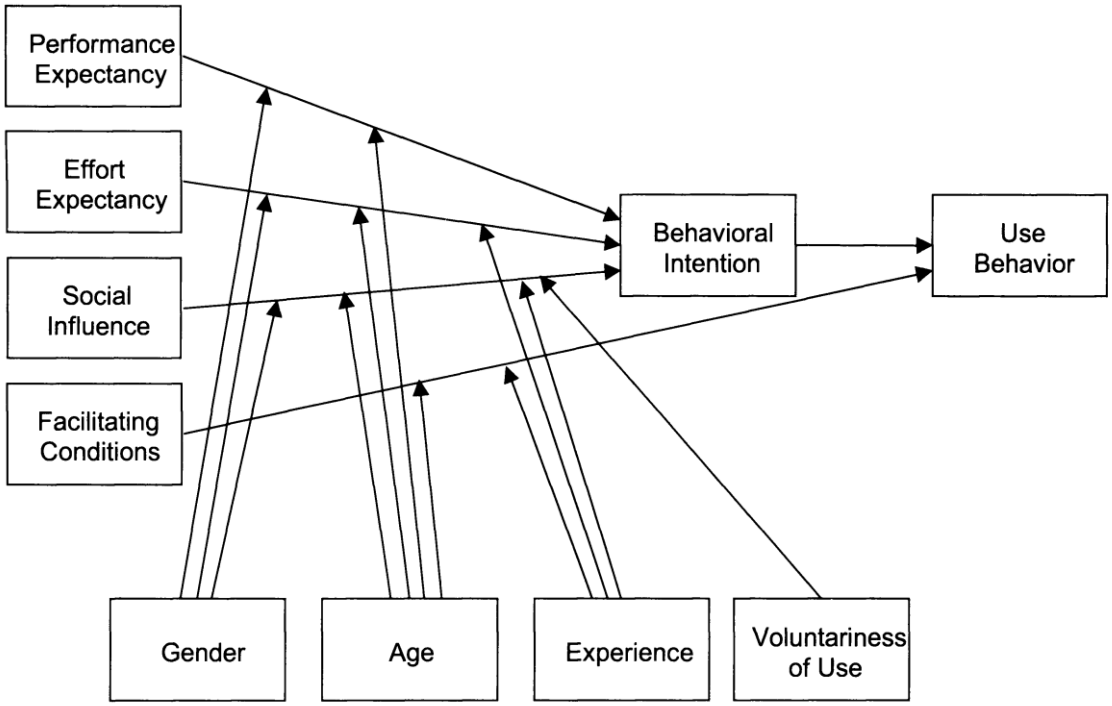

Figure 9: The UTAUT model (Venkatesh et al. 2003)

The UTAT (Figure 9) model consists of four determinants, which influence the usage behavior. Those four are performance expectancy, effort expectancy, social influence and facilitating conditions. They are as well influenced by key moderators gender, age, experience and voluntariness of use.

Performance expectancy is defined as the amount of believe the individual has that the system will help to increase the performance in the job. The determent is moderated by gender and age. Regarding gender, men are supposed to be highly task-oriented and

therefore performance expectancies are more salient to men. Regarding age, younger individuals are supposed to be more influenced by rewards coming from the outside and therefore performance expectancy is a stronger determent for younger individuals (Venkatesh et al. 2003).

The ease of use of the system influences the effort expectancy. The complexity of the new solutions determines the effort expectancy. The moderators influencing the determinant are gender, age and experience. So the effect will be stronger for women, older workers and those with limited experience (Venkatesh et al. 2003).

Social influence represents the impact of the way an individual thinks an important other thinks the system should be used. This determinant is influenced by gender, age, voluntariness and experience. It is supposed to be stronger for women, older workers, under conditions of mandatory use and with less experience (Venkatesh et al. 2003).

The last determinant facilitating conditions is defined as the degree of believe from an individual for the support for the system. The support is expected from an organizational and technical infrastructure. The effect is supposed to be stronger for individuals of higher age and more experience (Venkatesh et al. 2003).

The determinants performance expectancy, effort expectancy and social influence are combined the behavioral intention which has a significant influence on the usage of the innovation. Facilitating conditions on the other hand does not have influence on predicting the behavioral intention but directly on the use behavior. The reason is that a support can remove obstacles and assist the ongoing usage (Venkatesh et al. 2003).

2.6.2 (Extended) Technology Adoption Model

Davis (1985) analyzes the factors leading to acceptance of computer systems. His work resulted in the Technology Acceptance Model (TAM), which has been cited various times and has been used for different studies.

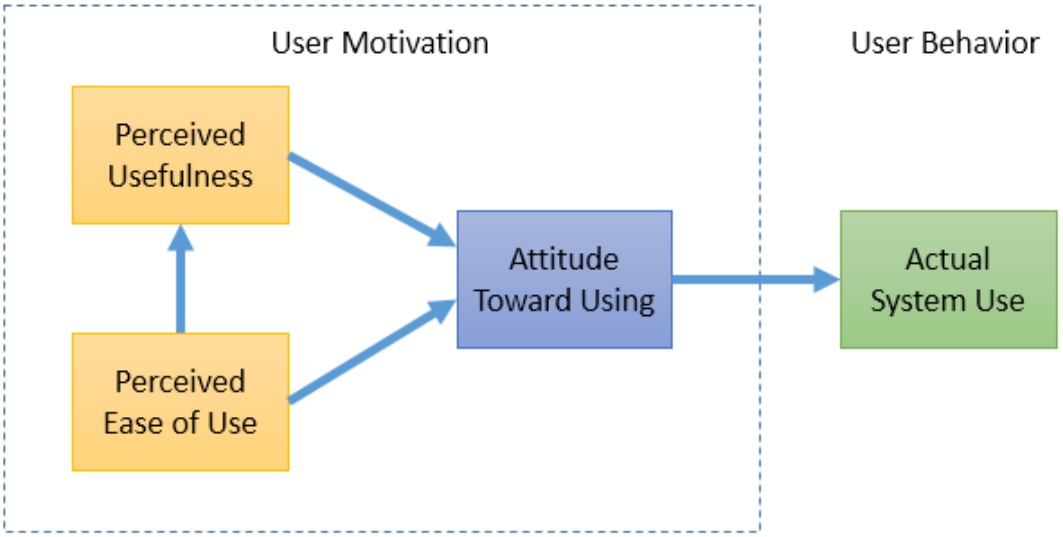

Figure 10: Technology acceptance model (adapted from Davis (1985, p24))

The TAM (Figure 10) illustrates that an individual's system use depends on his overall attitude towards the system. This overall attitude results out of two beliefs, the perceived usefulness and the perceived ease of use. Perceived ease of use itself influences the perceived usefulness as well.

The TAM is based on Ajzen and Fishbein's (1975) paradigm, saying the attitude toward using is the evaluation of an individual using the system. According to them, perceived usefulness can be defined as an individual belief that a system will improve the performance at work. Perceived ease of use is the belief of an individual how effortless the system use will be (Ajzen & Fishbein 1977).

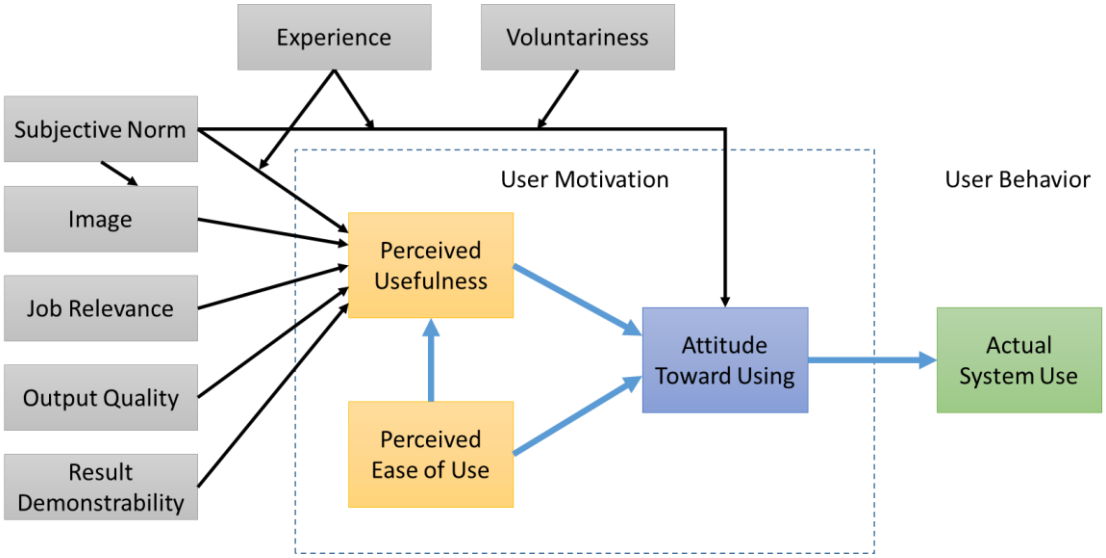

Figure 11: Extended Technology Acceptance Model (adapted from Venkatesh et al. (2000), p197)

The Extended Technology Acceptance Model (TAM2) adds further influencers, which influence the usage adoption behavior (Figure 11). The role of those influencers will be briefly explained according to Venkatesh et al. (2000):

Subjective norm: Influence of what other individuals that are important to a specific individual think. The influencer is moderated by voluntariness and experience. The influencer is stronger while system use is mandatory and the longer the system proves working and the individual experienced it becomes stronger as well.

Image: If the systems use is supposed to improve an individual's status in a group, it will enhance the perceived usefulness.

Job relevance: The opinion of an individual regarding whether the technology is relevant for the job which will positively influence the usage.

Output quality: The received impressions on how good the system performs in order to assist an individual with its work. The better the quality the higher the positive influence.

Result demonstrability: A system that allows a presentation of its effectiveness has positive influence on the perceived usefulness rather than systems which do not allow such a presentation easily.

2.7 Conclusion of the Literature Review

The term BD has been a buzz word in literature for years (Halaweh & El Massry 2015). Some companies started using BD in order to strengthen their market position and develop their potential. But still many companies are in an early stage of adopting the possibilities of BD (Kwon et al. 2014). While much research has been put into how to process BD, less effort has been put into the question of how to make use of it and how to adopt it into an organization (Riggins & Wamba 2015).

3. Research Methodology

The methodology chapter describes the way how the research was done (Ellis et al. 2008). In this chapter, the general approach of the methodology is explained according to the research onion presentation of Saunders et al. (2012).

3.1 Introduction

The research follows an interpretivist stance, studying a social environment focussing on qualitative data. Interpretivism studies amongst individuals rather than objects and takes an empathetic position to understand the world and proof it with compared small qualitative samples of a careful exact analysis (Saunders & Tosey 2012).

The approach of the research is inductive. Data was gathered with interviews and analyzed.

The research strategy selected is a case study. The case was an oil and gas company in South Africa. The company introduced reporting in order to help their managers to improve the performance. The target of such a solution is the transfer of knowledge gained by BD to the different members. This is also the focus of the study. The procedure how the case study was applied on this selected case is described in detail in the following section.

The data collection method were interviews with the managers. The data gained with the interviews were analyzed. The interviews were recorded and then partly transcribed, observations and collected documents were summarized and categorized in order to validate the findings.

3.2 Case Study Structure

Writing a case study follows an iterative process. This section describes the steps and the reason why a case study has been chosen as method. Yin (2009) describes the process of a case study (Figure 12).

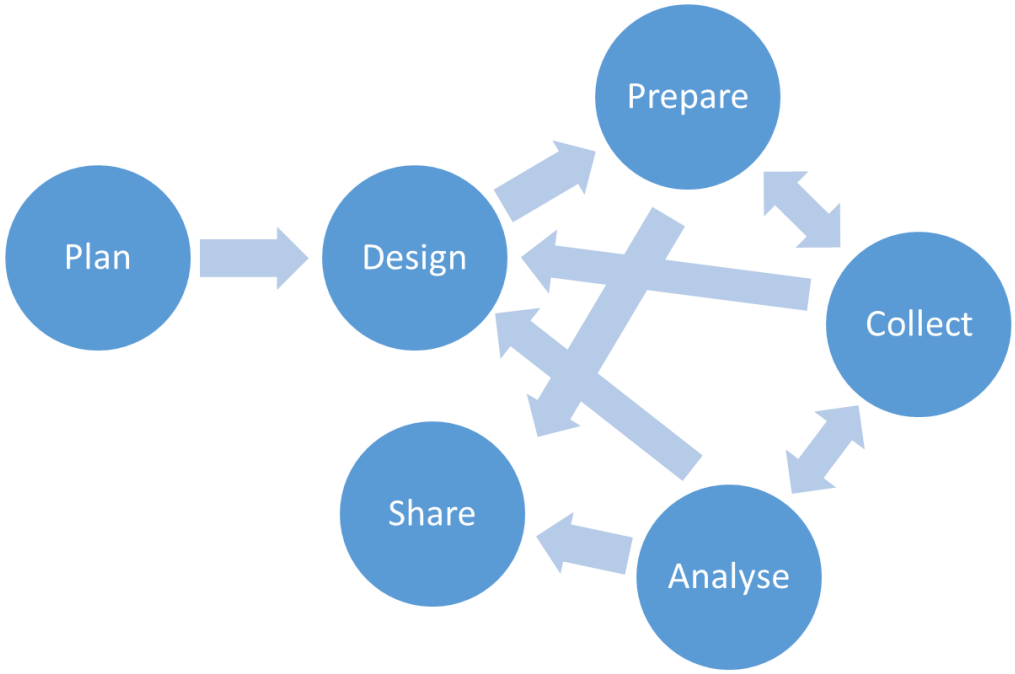

Figure 12: Case study structure (Yin 2009)

The starting point of the case study is the planning and it then enters an iterative procedure with different steps.

3.2.1 Plan Phase

The research starts with the plan phase. Actually every research starts with that phase, since the researcher has to think about which method to choose and why. Yin (2009) explains that a case study is preferred when the research is about a phenomenon within a real life event. The phenomenon in this research are the adoption problems of BD within an organization. Further, this is a real company based in South Africa. Yin (2009) also states that research questions are about how and why something occurs, which is the case of this study. The last decision criterion for Yin (2009) is the fact that the investigator has little influence over the events. Further, in a case study the researcher is confronted with a complicated real life situation, which probably has more variables than fix data points, which have to be observed and analyzed. Considering these variables, for example the complexity of the industry as well as the company, the involvement of human beings and

the dependence on quality data for decision making for operations and future strategies makes a case study the preferred choice as a research method.

3.2.2 Design Phase

The design phase sets the plan for the research. To conduct the case study, data from a company or a case is needed. This then is followed by identifying employees with the background and experience within the company as well as topic. This data is collected by means of interviews. Therefore, questions have to be prepared and interviewees selected.

The questions for the interview were created by analyzing different adoption models and creating a model specific for the adoption of the research problem. Using current research results of innovation adoption a framework fitting the specific requirements will be proposed. To create and validate the quality of the new framework experts from the domain of BD were consulted.

As for the interview partners, managers were selected using the new technology. In order to determine if there are any different adoption and usage factors, managers were selected which work with the technology and those who do not.

Since the study is about a single company, it is a single case design.

3.2.3 Preparation Phase

The preparation phase spends attention on reassuring that the investigator has the right skills, a training for the specific case study, creating a protocol, screening candidates and conducting a pilot case study.

Yin (2009) describes the right skills as being able to ask good questions, careful listening, being able to react to changes, having a deep knowledge about the issue being studied and being unbiased. In order to provide good questions, frameworks from literature have to be conducted and a questionnaire must be prepared. The skills for being a good listener cannot be prepared in a short period of time. In order to avoid missing information, at least two persons conducted the interviews if possible. Same is for being unbiased and

being flexible. These points have also be avoided by the strategy of having if possible not just one interviewer but at least two. To acquire the required knowledge, a deeper literature research has been conducted in order to be prepared. Before the interviews start, it also has been mad sure that all individuals who are going to be interviewed know what happens with the information they offer in the interview.

3.2.4 Data Collection

In their work, Baxter and Jack (2008) list six sources to collect information in case studies. Those sources include documentation, archival records, interviews, physical artifacts, direct observations, and participant observation.

While Baxter and Jack (2008) recommends to use multiple sources, the biggest information source are interviews made with different individuals as previously explained. This gives insight into issues such as special barriers, which already have been tackled or show already known problems. The reason for this is the unavailability of other sources and as Baxter and Jack (2008) warns the danger of too much data to analyze within this research.

The data collected for the case study needs to be stored in an orderly way. An important note from Stake (1995) is to separate the raw data from the interpreted report. That way an interested reader can always refer to the raw data.

Yin (2009) further states that when collecting data a chain of evidence must be kept. He compares the procedure to a crime scene, where the crime has to be explained by the evidence. The same way the reader of the case study has to understand, starting from the case study questions until the report how conclusions were made.

To summarize: data was collected by means of interviews. The interviewees were conveniently and purposefully selected. The interviews were led by using an interview guide (appendix I) that was created by compiling interview questions that were directly linked to the research problem and research questions. The interview guide was emailed to the interviewees two to three days before the interviews took place.

3.2.5 Analyze

Yin (2009) describes analyzing a case study as a big challenge. The questions asked during the interview were directly linked to the research questions and sub questions.

Further the analysis relies on the literature review. The findings are discussed with the literature in the discussion chapter. Especially the frameworks which describe and list influencers for the adoption of innovation. This plays together with the prepared questions and hence presents a most clear result. For this the patterns of information gained in the collection phase have been matched to the dependent and independent variables of the frameworks.

The data was analyzed by firstly transcribing all the interviews. Then keywords and key concepts were identified and summarized. From the summarized keywords and concepts findings emerged. The findings were then categorized and finally, categories were developed.

3.2.6 Share

The last part of the case study is sharing the results. The result is the complete case study in form of the Master's thesis. The main audience for the result are academics who evaluate the report but also the South African oil and gas company has to be considered as interested in the result. Hence the report was written in a manner to satisfy both target groups.

3.3 Ethics

Before starting the interviews, permission was to be obtained from the company. Also every interviewee was asked for permission and the purpose of the interviews was explained. The interviews did not disrupt the general work of the interviewee.

Research was undertaken in a scholarly and responsible way. Honesty, clarity, comprehensiveness as well as accountability were practiced. All sources of information

and support were acknowledged and the interviewees were assured that the findings are not used for the personal gain of the researcher.

Before starting the interviews, a written permission was asked from the interviews. As well as written as in person, the interviewees were informed that the sessions were recorded for the sole purpose of research and that the interviews were held as anonymously as possible. It also was explained that the participant could always stop the interview and ask for the deletion of the session also after having finished the interview. Further, the participants were not harmed or negatively impacted, and the research could be of benefit to the research participants. The research was executed in this way to ensure the dignity, confidentiality, anonymity and right of information. Therefore, no "vulnerable participants" exist.

This research did not have any harmful impact on the environment and no harmful material was dealt with in this study.

The research aims to improve the understanding to help South African business to further grow and use the potential of BD.

For this research no party has been sponsored.

4. Findings

This chapter focusses on presenting the findings out of the analysis of the interviews. To examine the problem statement “It is unclear how knowledge gained by BD is being transferred in an organization”, eight interviews in a South African oil and gas company were carried out. All participants work within the headquarters of the company.

The participants all have been several years with the company and provide work experience from nine to thirty years. Five participants have an IT background and are responsible for offering BD solutions and three participants are in a user role within the company.

In order to categorize the findings, four categories are defined to which the findings have are assigned.

The first category is System. Findings which are about characteristics of the system and available or missing features are assigned to this category.

The second category is Support and Training which includes all findings that are related to empower employees in order to work with BD analytic tools. This category also includes characteristics a person should possess in order to work with BD.

The Usage category describes the way BD is accessed and knowledge is transferred.

The last category Perceived Value expresses how the individuals perceive their possibilities to access knowledge gained by BD. This includes also direct dependencies of this Perceived Value.

The structure of this chapter corresponds to the research questions.

The sub research questions form the structure of the sub chapters. The content of them are the single interview questions and the derived findings of the answers from the participants. At the end of each subchapter is a summary that recapitulates the findings for the research questions. For further information, the interview guide with the structure and the questions is listed in the Appendix “I. Interview Guide”.

4.1 Factors that Affect the Transfer of Knowledge Created by Big Data Analytics

Following RQ1, this chapter aims to answer the question "What are the factors that affect the transfer of knowledge by employees who utilize the information created by BD analytics?". The structure is pursuing the assigned sub research questions:

- SRQ 1.1 What knowledge is transferred between employees within the organization?
- SRQ 1.2. What does support the transfer of knowledge gained from BD analytics within an organization?
- SRQ 1.3 What are the challenges experienced in the transfer of knowledge within the organization?

At the end of the chapter a short summary for the findings can be found.

4.1.1 Transferred Knowledge between Employees within the Organization

The interview questions of this part target to answer SRQ 1.1. "What knowledge is transferred between employees within the organization?". The findings are listed according to the interview questions (IQ).

IQ 1.1.1. What information do you access regularly?

The answers of this question is highly dependent on the interviewed person. For a person in HR obviously HR reporting is most relevant while others mention mainly sales, volume, income and turnover. Other areas are covered by BD analytics as well, which include supply chain and customer analytics.

This directly describes how the system is accessed and based on that is assigned to the category usage.

Finding 1: Dependent on the person's area of work, different analytic areas are accessed.

IQ 1.1.2. Which knowledge do you rate as most important for your job?

The interview partners have interpreted this question in two ways. Some answered the area of data, e.g. Sales, HR or Volume data; others answered with the skills and knowledge you need in order to access BD analytics. The relevant area of data is linked to the person's position (e.g. HR manager needs HR analytics). This conclusion is also supported by Finding 1, which has been derived of IQ 1.1.1.

A participant filling the role of a solution architect states that "Realizing the potential of the information, that itself is a whole different skillset" (Appendix II, Row5/Interview#5). In order to access BD analytics a technical understanding, a business understanding and an interest in data, in particular analyzing data, must be within the skillset of the user.

This findings relate to the necessary knowledge of an employee in order to work with BD analytics and for that reason, they are assigned to the category Support and Training.

Finding 2: Business understanding and knowledge on how to analyze data are important and needed for insight.

IQ 1.1.3. What knowledge do you inform your colleagues with?

Information gained by BD analytics in that company is passed on mainly by monthly standardized reporting. Periodically, management receives information collected by different employees in reports. This includes for example sales, income and volume reporting. The responsibility then is within the management to pass down the knowledge through the hierarchy.

A second way as described by a retail manager and an HR member is the concept of getting reports on request. That way someone with the ability and the access to get data does the analysis and delivers the knowledge gained by BD in form of a requested report to the respective person.

While stating that, one participant from the HR department states that "We don't do enough of it" (Appendix II, Row6/Interview#8). In the context that more information should be communicated to their colleagues from the HR department.

This finding is assigned to the category Usage because it describes the way how information is passed on.

Finding 3: Information gained by BD analytics is mainly passed on by standardized monthly reporting or delivered on request.

4.1.2 Factors that Support the Transfer of Knowledge Gained from Big Data Analytics

The interview questions of this part are targeting to answer SRQ 1.2. “What does support the transfer of knowledge gained from BD analytics within an organization?”. The findings are listed according to the IQ.

IQ 1.2.1. Who do you think is most important to make good use of the knowledge gained from big data analytics?

In order to support a good use of knowledge creation by BD analytics the interviewed employees have rated management support as most important. As stated by the interviewed solution architect "The key users would be obviously the business leadership, they need to recognize the advantages that come behind through the adoption of analytical tools" (Appendix II, Row8/Interview#4). Which means that business leadership needs to see the value gained by BD analytics in order to support adoption.

Since this is a direct dependency to Perceived Value, it belongs by definition to this category.

Finding 4: It is important to gain business leadership support, which is gained by having management recognize the value.

Next to the business leadership, it is mentioned that there is need for individuals who are able to get insights out of the data. Those mentioned are mainly business analysts. As one participant from IT top management states this could be linked to the maturity of the organization. He describes that with increasing maturity of an organization “The transition is from business analyst, through to citizen scientists, and then in future getting

to all employees where you can start saying everybody can contribute to insight in an organization." (Appendix II, Row8/Interview#6)

Since this finding describes that certain skills are needed, it is therefore assigned to the category Support and Training.

Finding 5: For a good use of BD analytics individuals with the right skills are needed to gain insights.

IQ 1.2.2. What do you think is most important to make good use of the knowledge gained from big data analytics?

The most mentioned factor for the usage of BD analytics is the data quality. Nearly every participant mentioned the importance of a high data quality during the interview. One of the participants from IT top management states: "The first point of departure has to be around the accuracy of the data of the organization" (Appendix II, Row9/Interview#6). For the data to be trusted, this includes that the data must be right and complete.

Since this is a requirement to the available data, this findings is categorized as System.

Finding 6: In order to make use of BD analytics a high data quality must be achieved.

As in the question before (finding 5) again the right person with the right skills have been mentioned several times. The traits this person should have include an innovative mentality and an understanding of how to interrogate data. The person further should be passionate about this kind of work. Together with the call for the right person there is also a call for the right training of employees, to enable them to access the knowledge of BD analytics. A member from HR describes that the users must be trained in what is available and how to use it. The right skill to be trained is also described by the solution architect as being able to interrogate, detect trends and understand the data.

This correlates directly with the training of the employee and belongs to the category Support and Training.

Finding 7: To gain insights out of BD analytics the users must be trained in what is available and how to use it.

Next to the training it is also crucial to get the right person into the analytic position. As stated by a member of the top IT management, you have to “Put people into position that are passionate about data and analytics” *(Appendix II, Row9/Interview#6)*. A retail manager of the company describes the person further as having an innovative mentality and creativity. This information differentiate from the training aspect mentioned in the previous finding. The statement more explains that next to knowledge it is most important to be a special kind of person with the interest and excitement to work with data.

This described the characteristics of a candidate that is able to create information or knowledge out of big data and thereby belongs to the category Support and Training.

Finding 8: In order to access knowledge gained by BD it is important to place individuals with passion for data and an innovative mentality and creativity into the right position.

4.1.3 Barriers in the Transfer of Knowledge Gained of Big Data Analytics

The interview questions of this part are targeting to answer SRQ 1.3 “What are the challenges experienced in the transfer of knowledge within the organization?”. The findings are listed according to the IQ.

IQ 1.3.1. What makes it difficult to access the knowledge you need for your work?

After explaining the enablers for adoption in the previous section, this question tackles the barriers. As the first point, it is mentioned, that the data availability is too slow. In order to react and make decision especially in the fast paced retail part of the company, data must be made available within BD analytics as soon as possible. There is a demand to have the data real-time. It is also stated that this is different in other units of the company, for example the manufacturing department in that company needs the information not as fast as the mentioned retail department. The reason for this is that retail has to react really fast while manufacturing makes decisions some months in advance.

This findings relate to a technical aspect and is for that reason assigned to the category System.

Finding 9: Depending on the field of application data is available too slow.

Bad data quality is mentioned many times. This finding has been explained with finding 6. If the data quality is not good enough, the users are insecure and do not trust the results. As stated by a retail manager "I might be able to run a report but I'm not sure whether it is a 100% of the story or 99%" (Appendix II, Row11/Interview#2). And one percent can make the difference within a decision.

Another hurdle is the complexity of technology. Different employees have different skillsets and interests in BD analytics and this can be technologically challenging. So a retail manager states: "I find it quite technical [...] this is not really my space. I rather ask somebody else to do it for me, […] because I don't feel that confident to do it in the first place, I'm not technically skilled to build something out of it […]"(Appendix II, Row11/Interview#2). As a conclusion the technology solution needs to be easy to use or assistance has to be offered in order to gain insight out of BD analytics. This difficulty also stays in correlation within the training (Finding 7) of the individuals as the IT analytics manager states: "Once user use it more frequently that hurdle [technological difficulties] will go away" (Appendix II, Row11/Interview#3).

This finding backs the support aspect and is assigned to the category Support and Training.

Finding 10: Technology is too difficult and support is needed.

In this question, Finding 5 and Finding 7 are supported by the call for individuals with the right skills and the right training. The interviews leave the impression that there can be a certain skill achieved with training as mentioned by a BI specialist: "The training of the users in the tools that are out there would definitely help to transfer the knowledge better in the organization." (Appendix II, Row11/Interview#4) On the other side, it is mentioned, that a specific person is needed to make use of the data as stated by a retail manager: "Somebody needs to make sense what's coming through and then tell a story about it" (Appendix II, Row11/Interview#2). The person needs a curiosity for data, the knowledge how to work with it as well as expertise in business and IT.

Right now BD analytics in the company can only be accessed by the means of a computer. This is not practical for all user groups. The BI specialist said that "Convenience

Managers, they are not sitting in the office here, running the reports, they are out there" (Appendix II, Row11/Interview#4). In order to spread the knowledge of BD analytics some interviewees request an independent mobile environment accessible with a smartphone or tablet.

Since this finding represent a missing feature, it belongs by definition to the category System.

Finding 11: System are not available on mobile devices.

A further challenge mentioned is the fact that business must see the value and benefit of knowledge gained by BD. The special situation is that a solution needs to offer value for business. This situation is special because in order to develop a solution the development has to be supported by the business as well and during the development, the benefits are not always that obvious. To tackle this specific problem one way is including the users in different development phases and advertise the solution. Right now they "don't rub it enough under their noses" (Appendix II, Row11/Interview#8), as a participant from HR department says. This resonates with finding 4.

Another decisive possible barrier is a too slow working solution. One interviewed person states that he sometimes has to run reports in the background and do other tasks while waiting for the results. In order to improve the adoption of the system a highly performant system is needed.

Performance is a technical aspect and is assigned to the category System.

Finding 12: System performance is too slow.

IQ 1.3.2. What knowledge are you missing for your work and what stops you from accessing it?

As an answer of this question most interview partners responded that they would like to move to an environment that helps them to predict events. An example for one of those events could be higher sales in a certain region, caused by holidays. The analytics manager explained that "We have to move from the reporting paragon, which is effectively looking back to a forward looking view." (Appendix II, Row12/Interview#3)

This finding is a missing feature and assigned to the category System.

Finding 13: Predictive analytics are missing.

Another knowledge reservoir missing is unstructured data. This unstructured data could come from machines used in the company or social media. The big challenges here named by an interview partner is finding out what unstructured information is needed and how best to integrate it.

Like the previous finding, this also is a missing part and belongs to the category System.

Finding 14: Unstructured data is missing.

4.2 Transfer of the Knowledge Created by BD Analytics amongst Employees

Following RQ2 this chapter aims to answer the question "How can the knowledge created by BD analytics be transferred amongst employees?". The structure is pursuing the assigned two sub research questions:

- SRQ 2.1 How are the information and knowledge made available within an organization?
- SRQ 2.2 How is needed knowledge transferred within the organization?

At the end of the sub chapter is a short summary for the findings of RQ2.

4.2.1 Access to Information and Knowledge within the Organisation

The interview questions of this part are targeting to answer SRQ 2.1 "How are the information and knowledge made available within an organization?". The findings are listed according to the IQ.

IQ 2.1.1. Who uses knowledge gained by BD analytics?

The user base at the company is mainly the management or employees getting the numbers for them. In the hierarchy of the company, mainly upper management like the area or even national managers use the knowledge of BD. Business analysts are mentioned as the main user group analysing BD for the management.

This finding is assigned to the category Usage because it describes the way how information is accessed.

Finding 15: Managers use the system or ask analysts to get the results.

In the interviews, it is also mentioned that the users' base who need knowledge gained by BD is much broader. A member of IT top management stated: "If you are looking at management decisions made by different layers in your organization about 20% of your decisions are made by your senior management and executive team, that means that 80% of your employees could be making very valuable management decisions, if they were given access to the right data." (Appendix II, Row3/Interview#6) Another argument for making the knowledge available for potentially everyone - who is in charge of decisions - is that people that work in every day operations are more likely to find patterns and trends in the data derived of the work they are doing. In the interview it was further explained that the user base is defined by the maturity of the organization.

This finding describes the potential users and is therefore related and assigned to the category Usage.

Finding 16: Depending on maturity of the organization potentially everyone could use knowledge gained by BD.

IQ 2.1.2. What possibilities are available to access information and knowledge in the company?

The information from BD is accessible for the employees by different tools. The company uses mainly SAP data warehouse products. Those are the Business Object tools and

Lumira. As non- SAP products Tableau and QlikView are used. The company uses a portal to access the different reports.

This describes the technical ways to access knowledge gained by BD and is by definition assigned to the category System.

Finding 17: Information from BD is accessed by different reporting tools.

While some people access the reports and information directly via the system by themselves, there is also another popular way which is described by a participant working in the HR division: "They like the concept of phone and get a report"(Appendix II, Row15/Interview#8). This is also linked to the findings which explain that the technology is too complex for people without the right technical skills to access it and this alternative way is used.

IQ 2.1.3. What do you think are the advantages or disadvantages of the previous mentioned possibilities?

In general, the interviewed individuals seem to be positive about their environment, describing the advantages as “endless” (Appendix II, Row16/Interview#2). The current possibilities to independently access knowledge offer different technical aspects like being integrated in Excel, allow story telling (which means data visualization) and is ready for predictive analytics.

This finding expresses how the interviewees rate their possibilities of accessing BD and belongs to the category Perceived Value.

Finding 18: The current environment is seen very positive and with lot of expectation, independent report access is possible.

Still it is missing the usage of predictive analytics and also additional unstructured information, which is already mentioned in Finding 13 and Finding 14.

4.2.2 Ways of Transferring Knowledge within the Organization

The interview questions of this part are targeting to answer SRQ 2.2 “How is needed knowledge transferred within the organization?”. The findings are listed according to the IQ.

IQ 2.2.1. How do you know who needs to know what?

As discussed within IQ 1.1.4. and Finding 5, the knowledge gained out of BD analytics is mainly passed on by monthly standard reporting. In addition to that question, it is mentioned that business usually comes with requests for new reports to the IT department or the business analysts. Those then help with the task of reporting: "[…] by understanding customer requirements, it's by understanding the challenges that exist in the business, it's by understanding the business strategy." "(Appendix II, Row20/Interview#5), as a solution manager explains. The problem with that approach is that "At the moment in [this company] you only know who needs to know what when they ask for it." (Appendix II, Row20/Interview#4), explains the BI specialist. For this reason, there is a lack of knowledge transfer between the required analytics and the possibilities of BD analytics. Further the BI specialist states: "A lot of times we as the BI team are missing opportunities because the business does not know what we can provide and they don't ask the right person maybe" (Appendix II, Row20/Interview#4).

This finding is about how information is passed on and thus belongs to the category Usage.

Finding 19: Individuals have to actively communicate their needs and requirements.

4.3 Summary of Findings

The findings derived from the different questions have been assigned to four categories which were defined at the beginning of Chapter 4. The first category is System, which includes all technical or feature related findings. The second category is Support and

Training, which is all about skills and how to enable employees to use the solution in place. The third category is Usage is explaining the way BD is accessed and knowledge is transferred, and the last category is Perceived Value, which elaborates the perceived access to BD capabilities within organizations.

In order to gain insight for the problem how knowledge gained by BD is being transferred in an organization, the first research question explored for the factors that affect the knowledge transfer. This research question itself is divided into three sub research questions (Table 1) whereas the first question targets to reveal what knowledge is transferred between employees, second investigates for enablers of knowledge transfer within the organization and third looking for the challenges in transferring of the knowledge. All those questions are in the BD analytic context.

Table 1: Summary of research question 1

Problem Statement: It is unclear how knowledge gained by BD is being transferred within an organization.	
RQ1: "What are the factors that affect the transfer of knowledge by employees who utilize the information created by BD analytics?"	
SRQ 1.1 What knowledge is transferred between employees within the organization?	
Findings	**Categories**
Finding 1: Dependent on the person's area of work, different analytic areas are accessed.	Usage
Finding 2: Business understanding and knowledge on how to analyze data are important and needed for insight.	Support and Training
Finding 3: Information gained by BD analytics is mainly passed on by standardized monthly reporting or delivered on request.	Usage
SRQ 1.2. What does support the transfer of knowledge gained from BD analytics within an organization?	
Finding 4: It is important to gain business leadership support, which is gained by having management recognize the value.	Perceived value
Finding 5: For a good use of BD analytics individuals with the right skills are needed to gain insights.	Support and Training
Finding 6: In order to make use of BD analytics a high data quality must be achieved.	System

Finding 7: To gain insights out of BD analytics the users must be trained in what is available and how to use it.	Support and Training
Finding 8: In order to access knowledge gained by BD it is important to place individuals with passion for data and an innovative mentality and creativity into the right position.	Support and Training
SRQ 1.3 What are the challenges experienced in the transfer of knowledge within the organization?	
Finding 9: Depending on the field of application data is available too slow.	System
Finding 10: Technology is too difficult and support is needed.	Support and Training
Finding 11: System are not available on mobile devices.	System
Finding 12: System performance is too slow.	System
Finding 13: Predictive analytics are missing.	System
Finding 14: Unstructured data is missing.	System

The first sub research question about what knowledge of BD analytics is being transferred three findings have been declared. The knowledge accessed depends of the area of work of the individual (Finding 1). Whereas someone working in human resources primary will access staff reporting, a retail analyst is more interested in turnover related insights. In addition, the interviews revealed that the knowledge how to gain insights out of BD is crucial (Finding 2). Finally, gained knowledge then is being shared within the organization in form of monthly reports, which are targeted at a specific audience (Finding 3).

The second sub research question examines the factors that support knowledge transfer in the context of BD analytics. The interview showed that it is crucial to have business leadership support. To gain this support, the business leadership have to recognize the value (Finding 4). The next important factor is having the right people. In order to make use of BD and get the knowledge transferred, individuals with the right skills to make use and produce insights out of BD are needed (Finding 5). A decisive factor to create trust in the results of the analytics is good data quality that must be developed and maintained (Finding 6). In order to enable individuals using the tools to gain insight out of BD, they must be trained accordingly (Finding 7).

The last sub research question targets the challenges of knowledge transfer. There the individuals stated that the data availability is not fast enough. For example in retail, the data has to be available as soon as possible, best instantly when entered into the system (Finding 9). The next mentioned challenge is that the system is too complicated and support is required (Finding 10). Further, there is the need to access the knowledge on mobile devices (Finding 11) which is not satisfied. Especially for people working in the field this is a barrier for accessing the knowledge. Also the individuals cannot access the knowledge fast, so a slow system is another hindrance for the usage (Finding 12). The last two findings (Finding 13 and Finding 14) are about missing knowledge, users now can't access unstructured data and predictive analytics which they would see value in.

The second research question searches for the ways how knowledge is being transferred. This research question itself is divided into two sub research questions. The first sub research question is working on how the knowledge is made available while the second is aiming on how it is transferred.

Like with the first research question, those findings have been assigned to the predefined categories (Table 2).

Table 2: Summary of research question 2

Problem Statement: It is unclear how knowledge gained by BD is being transferred within an organization.	
RQ2: How can the knowledge created by BD analytics be transferred amongst employees?	
SRQ 2.1. How are the information and knowledge made available within an organization?	
Findings	**Categories**
Finding 15: Managers use the system or ask analysts to get the results.	Usage
Finding 16: Depending on maturity of the organization potentially everyone could use knowledge gained by BD.	Usage
Finding 17: Information from BD is accessed by different reporting tools.	System
Finding 18: The current environment is seen very positive and with lot of expectation, independent report access is possible.	Perceived value
SRQ 2.2. How is needed knowledge transferred within the organization?	
Finding 19: Individuals have to actively communicate their needs and requirements.	Usage

The first sub research question about how the knowledge is made available revealed that the managers either use the system directly or ask analysts to get them the results (Finding 15). So while the main users of this company are mostly managers and analysts the participants stated that depending on the maturity of the system and the company potentially everyone could use it (Finding 16). To access the system, different reporting tools are used (Finding 17), from which the potential is seen as very positive, also because independent report access is possible (Finding 18).

The second sub research question about how needed knowledge is transferred within the organization revealed that it happens on request. Individuals in need of the knowledge need to ask or request it in order to receive it (Finding 19).

5. Discussion

In this chapter, the results of the research are discussed and set in context with literature. The aim of this thesis is to find enablers and barriers on transfer of knowledge gained by BD within the company. The two following research questions have been asked:

- RQ1 “What are the factors that affect the transfer of knowledge by employees who utilize the information created by BD analytics?”
- RQ2 “How can the knowledge created by BD analytics be transferred amongst employees?”

The findings have been assigned to predefined categories in chapter 4. These categories are discussed with the findings of the literature.

Table 3: Categories defined by the key words and research questions

Category	**Findings**	**Research Question**
System	**Finding 6**: In order to make use of BD analytics a high data quality must be achieved. **Finding 9**: Depending on the field of application data is available too slow. **Finding 11**: System are not available on mobile devices. **Finding 12**: System performance is too slow. **Finding 13**: Predictive analytics are missing. **Finding 14**: Unstructured data is missing. **Finding 17**: Information from BD is accessed by different reporting tools.	SRQ1.2 SRQ1.3 SRQ 2.1
Support and Training	**Finding 2**: Business understanding and knowledge on how to analyze data are important and needed for insight. **Finding 5**: For a good use of BD analytics individuals with the right skills are needed to gain insights. **Finding 7**: To gain insights out of BD analytics the users must be trained in what is available and how to use it. **Finding 8**: In order to access knowledge gained by BD it is important to place individuals with passion for data and an innovative mentality and creativity into the right position. **Finding 10**: Technology is too difficult and support is needed.	SRQ1.1 SRQ1.2 SRQ1.3

Usage	**Finding 1**: Dependent on the person's area of work, different analytic areas are accessed. **Finding 3**: Information gained by BD analytics is mainly passed on by standardized monthly reporting or delivered on request. **Finding 15**: Managers use the system or ask analysts to get the results. **Finding 16**: Depending on maturity of the organization potentially everyone could use knowledge gained by BD. **Finding 19**: Individuals have to actively communicate their needs and requirements.	SRQ1.1 SRQ2.1 SRQ2.2
Perceived value	**Finding 4**: It is important to gain business leadership support, which is gained by having management recognize the value. **Finding 18**: The current environment is seen very positive and with lot of expectation, independent report access is possible.	SRQ 1.2 SRQ 2.1

The first category is "System" and answers SRQ 1.2, SRQ 1.3 and SRQ 2.1. All those findings have a more technical or data based background.

The findings of the category "System" are divided into three different parts, the first being about the quality of the system, which includes data quality, up to date data and performance. The second is about missing features of the system, which are mobile reporting, predictive analytics and unstructured data. The last one is tools, which basically just describes the current possibilities of accessing BD analytics.

The first part "quality of the system" is also supported in the work of Puklavec & Oliveira (2014) as "organizational data environment", mentioning the same factors. Regarding the acceptance models (section 2.6) the quality of system fits to Venkatesh et al. (2000) TAM2 "Output quality" factor which influence the perceived usefulness originating from Davis (1989) TAM framework. In the adoption cycle (section 2.5), in conclusion, it belongs to the acceptation phase.

The "missing features" describe functionalities, which would enhance current possibilities. Regarding the adoption phases (section 2.5) it either could be seen as a completely new innovation or as an extension of the current environment. Alternatively, it could be added to the acceptance phase regarding an expected output (fitting to the frameworks in chapter 2.6). The missing features stop certain user groups from using it. These are for example the retail managers mentioned in the findings (section 4). While it was not specifically stated, the unstructured data and predictive analytics could also stop

certain users from using it, because they do not see the benefit from the solution. For that reason, the missing features are assigned to the acceptance phase of the adoption cycle within the perceived usefulness context.

The last category tools describes the current state of the system. While this cannot be added directly to the adoption phases, it describes the current situation which can be compared to the ideal situation including the missing features.

The second category developed is “Support and Training” which answers SRQ1.1, SRQ1.2 and SRQ1.3. It consists of skills, training, ease of use and support.

Skills, on the one hand, corresponds to use the system to access knowledge gained by BD and knowing what is available. On the other hand, skills have been linked within the interviews to passion for analyzing data, innovativeness and creativity. While the first part is probably achievable by training and support, the other one is a trait individual for a person. User support and computer experience have been named by Jeyaraj et al. (2006) as two of the most influencing individual adoption factors. Ho et al. (2011) linked in their work passion to increased performance at work, and in his book, Sawyer (2011) describes innovation and creativity as the highest levels of human performance. This type of influence is not mentioned in the other adoption frameworks. Since it is important for the adoption of knowledge gained by BD, it is a new influencer named “individual performance”.

Ease of use, i.e. the perspective whether a solution is difficult to use or easy to use, is dominant in both acceptance models of the literature research (section 2.6). The UTAUT model shows it as effort expectancy and the TAM/TAM2 as perceived ease of use.

The category “Usage” consists of analytics area, information flow, information access, user requirements as well as users and answers SRQ1.1, SRQ2.1 and SRQ2.2.

The main statement of analytics area is that individuals should have access to the specific knowledge that they need for their work. The availability of this information is linked to the perceived usefulness which is one of the five important individual adoption factors according to Jeyaraj et al. (2006) as well as a criterion of the acceptance frameworks (section 2.6).

Information flow and information access are quite similar. Information flow describes mainly how the information is pushed through the company by monthly reporting and passed down the hierarchy according to the managers' thinking. Following Nonaka (1994) modes of knowledge creation the manager then first internalizes the knowledge by processing the information by himself. Then the manager decides which information to pass on either through social interaction (socialization) or by making it explicit (e.g. in an email).

Information access consists of managers asking analysts or other persons with the appropriate skills to retrieve information out of the data. Basically, manager want to get information out of the data and first need someone to transform the data into information. The knowledge pyramid of Ackoff (1989) shows the distinction between data, information and knowledge.

According to the interviews, the potential users of a BD analytics solution could be everyone who has to make decisions. Chen et al. (2012) list in their work different scenarios of decision making. For a large part, BD analytic tools support decisions, which supports this statement.

The category "Perceived Value" involves management support and answers SRQ 1.2 and SRQ 2.1.

Management support is mentioned by Jeyaraj et al. (2006) as one of the most central individual and organizational influencers. Also in the acceptance frameworks it is supposed to influence the intention to use and the attitude in a positive way. To gain management support, the management itself has to see a benefit within the solution.

Perceived Value is one of the main individual adoption influencers as well as a core element of both acceptance models of the literature section (section 2.5 and 2.6). And since in the interviews were a positive feedback about the value of the current possibilities it acts as an enabler.

6. Conclusion

In this research, a South African oil and gas company has been analyzed regarding their application of BD analytics. The research has been guided by the thesis statement “It is possible to identify and categorize the barriers and enablers for the transfer of knowledge gained by Big Data.”

In the summary, the statement is answered and the findings summarized. The contribution explains what value this research adds to the research pool while the last subchapter lists potential future research fields.

6.1 Summary

This research was aiming to categorize and identify barriers and enablers of knowledge transfer gained by BD. The findings of the interviews and discussion with the literature has produced a collection of information about how the transfer happens and is supported or stopped. A detailed explanation can be found in the chapters 4 and 5.

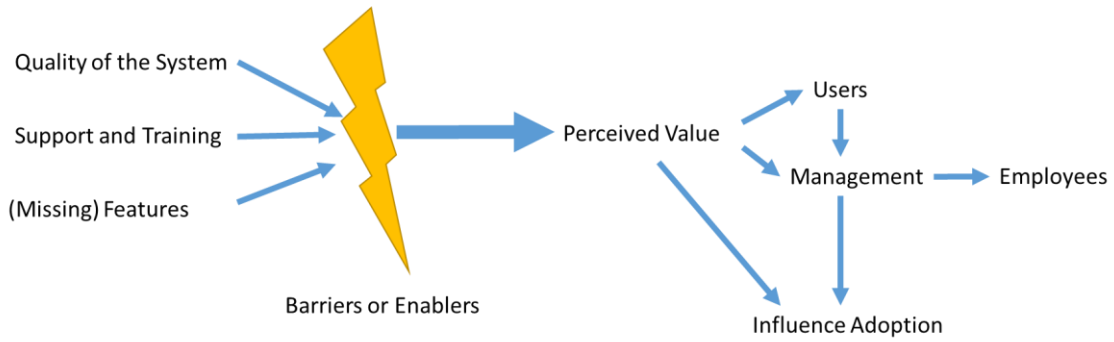

Figure 13: BD knowledge transfer model

To summarize the work and confirm the thesis statement, the findings have been captured in a BD knowledge transfer model (Figure 13).

In the research three barrier or enabler categories have been identified. Since during the interviews they have been mentioned either as barrier (if not existing) or as enabler (if existing), they are shown as both.

The first barrier or enabler is the quality of the system. To this category belongs the data quality which was mentioned from most participants. Also the IT top management

mentioned it as the most important enabler or barrier. It is necessary in order to achieve trust in the results. To the quality of the system also belongs performance and up to date data.

A further decisive barrier or enabler is support and training. Next to the data quality, skills were most mentioned. While the company has a lot of data on hands, there is a lack of people able to make sense of it. Essential for this barrier or enabler are training, support and an easy-to-use system. Also the right person has to have the technical understanding of the tools as well as the business understanding of what is important. During the interviews it was also mentioned that this person has to bring certain characteristics with her or him which is being passionate about data analysis, innovative and creative.

The missing features are mobile reporting, predictive analytics and unstructured data. Those features are also enabling or in the case of the oil and gas company, a barrier stopping individuals from accessing and thereby transferring this knowledge. For other analysis requirements, like monthly reporting and adhoc analyses, tools within the company are available to access the knowledge gained by BD.

Depending on whether these requirements are fulfilled Quality of the System, Support and Training and (Missing) Features act as barriers or enablers. Enablers raise the Perceived Value while barriers lower it. The Perceived Value directly influences the adoption of the BD analytics.

Also depending on the Perceived Value, people (like analysts or managers) use the knowledge gained by BD. The non-managers usually pass on the knowledge to managers who themselves communicate their gained knowledge to other employees. In that way, the knowledge gained by BD gets transferred though the hierarchies of the company.

The managers themselves are an important user group since they also influence the adoption. Management support has been mentioned as very significant during the interviews and in the literature. In order to support the adoption, management has to see the value of the knowledge gained from BD.

6.2 Contribution

This research covered the basics of adoption of innovation and technology. Often cited to that topic is Rogers' book Diffusion of Innovation (Rogers 2003) and the acceptance frameworks like the TAM or UTAUT (Davis 1989; Venkatesh et al. 2003). While those models and information are very general, researchers started looking for specific adoption criteria for specific applications (Park, S.Y.; Nam, M.; Cha 2012; Aldunate & Nussbaum 2013; Cheung & Vogel 2013).

This work contributes to closing the gap in research regarding the adoption criteria, the barriers and enablers, of transfer of knowledge gained by BD. Focussing on investigating the knowledge transfer process in a South African oil and gas company, several enablers and barriers have been identified and categorized. These enabler/barrier categories are Quality of the System, Support and Training and (Missing) Features.

Also the process of knowledge transfer has been elaborated. Either the manager creates knowledge out of BD by accessing it with the available tools or she/he has to ask an employee with the right skills to access it. The manager then passes on the knowledge through the hierarchy.

6.3 Future Research

While adding certain knowledge to the research pool, this thesis also creates a base for further research.

The results of this paper are based on one oil and gas company based in South Africa. To further generalize and prove the findings, other companies should be analyzed, also in other parts of the world.

During the interviews, it was mentioned that there is a dependency of the influencers regarding the maturity of the company. The first maturity criterion were mentioned by the IT top management. The first maturity criteria is who is using the information gained by BD analytics. A lower maturity would be, for example, just a few experts and managers using the information, while in a more mature environment a broad audience of different hierarchy levels would make use of it. The second criterion is the type of

analytics which are done. Being focused on historical reporting, thus analyzing the past would be rated as a lower maturity. Using the whole spectrum of analytics, including using the data to predict future outcomes, would be of higher maturity. Analyzing these maturity criteria and their behaviors in the adoption process and influencer would bring further insight into this topic.

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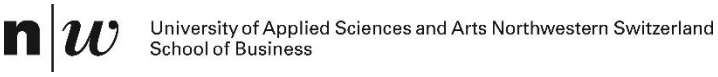
Abbreviations

BD	Big Data
ERP	Enterprise Resource Planning
IQ	Interview question
PS	Problem statement
RQ	Research question
SRQ	Sub research question
TAM	Technology Adoption Model
TAM2	Extended Technology Adoption Model
UTAUT	Unified Theory of Acceptance and Use of Technology

List of Figures

Appendix

I. Interview Guide



Semi-structured-questionnaires

Interview schedule:

Introductory remarks: In this global economy, to achieve success and improvement in the competitiveness of the business world, knowledge gained out of Big Data can be a competitive advantage. This study will be looking at the impact of adoption of Big Data analytic solutions on selected retail outlets in Western Cape.

The aim: This study seeks to identify the reasons why the adoption of big data analytics is difficult, and what are the potential barriers and enablers.

We are kindly requesting answers to the questions listed below in your good faith. Your answers will be used specifically for this study purposes only and they will be treated with the highest degree of confidentiality and privacy. Also participation in this interview is voluntary and allows anonymity as well as autonomy.

Section A: participant's details

Name: _____ Surname:_____ ___ Position: _____	Date:_____ ___ Contact No:_____

Section B: Questions

RQ1: What are the factors that affect the transfer of knowledge by employees who utilize the information created by BD analytics?

SRQ 1.1 What knowledge is transferred between employees within the organization?

1.1.1. Who uses knowledge gained by Big Data analytics?

Comment:

1.1.2. What information do you access regularly?

Comment:

1.1.3. Which knowledge do you rate as most important for your job?

Comment:

1.1.4. What knowledge do you inform colleagues with?

Comment:

SRQ 1.2 What does support the transfer of knowledge gained from Big Data analytics within an organization?

1.2.1. Who do you think is most important to make good use of the knowledge gained from Big Data analytics?

Comment:

1.2.2. What do you think is most important to make good use of the knowledge gained from Big Data analytics?

Comment:

SRQ 1.3 What are the challenges experienced in the transfer of knowledge within the organization?

1.3.1. What makes it difficult to access the knowledge you need for your work?

Comment:

1.3.2. What knowledge are you missing for your work and what stops you from accessing it?

Comment:

RQ 2: How can the knowledge created by Big Data analytics be transferred amongst employees? (the managers?)

SRQ 2.1 How are the information and knowledge made available within an organization?

2.1.1. What possibilities are available to access information and knowledge in the company?

Comment:

2.1.2. What do you think are the advantages or disadvantages of the previous mentioned possibilities?

Comment:

SRQ 2.2 How is needed knowledge transferred within the organization?

2.2.1. How do you access the information needed for you work?

Comment:

2.2.2. How do you pass on knowledge gained by Big Data analytics?

Comment:

2.2.3. How do you know who needs to know what?

Comment:

Thank you for your time and patience in answering the questions. Your contribution is highly appreciated.

II. Interview Analysis Spreadsheet

The spreadsheet as Excel file is available on request.

Row		#1 BI Specialist	#2 Retail Manager	#3 Analytics Manager	#4 BI Specialist
1	**RQ1: What are the factors that affect the transfer of knowledge created by big data analytics?**				
2	**SRQ 1.1** What knowledge is transferred between employees within the organization?				
3	1.1.1. Who uses knowledge gained by big data analytics?		Sales teams, convenience teams - need of the right resources to use the system! No mature in big data analytics 1.2.1. End-users are not limited, those who can make sense of it are	Retail data, point of sale data on daily base Retail business analyst Data from 1200 Service stations	Area managers, national managers, convenience managers Third party extracts
4	1.1.2. What information do you access regularly?	Q1.1.1. Customer Analytics, Supply Chain Operations, People Analytics, Monthly Reporting MIS,Triple E Transformation ERP System (SAP), Tank Master (Sensors, Probes in Tanks), 1200 (600 Retail) Sites		Volumes, Convenience store information (handled externally now) -> Product and Price	Sales, volume, income, turnover Volume is what we are selling out to the sites "Sales is what the site is selling to the end customer" "That sites sales information becomes our turnover information" "And then that turnover information becomes our income" Focus on what promotions to do and what is [this company]'s income"
5	1.1.3. Which knowledge do you rate as most important for your job?	staying up with technology, aligning with business, Data is most important when set as a target/goal from management, BI support business process	Volume, geographic information & detecting trends, industry comparison	Missing of skills, data scientists, statistics & business analysts -> more Insights of data is needed "Giving the business more than reports, something to identify opportunities [...]" "We've got an immense wealth of data sitting there" -> but need to use it more effectively! Input Andre -> Moving more towards to be an enabler of business. Users are trained in new OLAP tools, big focus on self service -> moving away from depending on IT department	Sales (Fuel and Convenience perspective) and Volume information
6	1.1.4. What knowledge do you inform colleagues with?	Stories	Monthly reporting, Information gets collected and corrected through local sales management because some information gets missing and the local team knows best		Month's end reporting gets presented, How sales, income and volumes is going, why it's going up or down, how to react
7	**SRQ 1.2** What does support the transfer of knowledge gained from big data analytics within an organization?				
8	1.2.1. Who do you think is most important to make good use of the knowledge gained from big data analytics?	Different BI personas who uses: Decision Makers (don't create but get provided), Analysts (self serviced), normal consumers System coordinators, Super users -> they communicate changes	Marketing people for opportunities, Creativity is very important! -> respond to what big data is telling "Willingness from management to actually support what comes out of the data"	Power users, not office workers, people responsible for growth, decision makers, sales focused IT supports adoption "It's not just adoption of the new tools" "Opportunity and use cases are immense, just in normal day to day operational side of business" Knowledge worker, influencer and decision maker Q1.2.1. Skills are needed, top management supports "They can extract value from what we got"	The business analyst, the retail analyst Convenience managers
9	1.2.2. What do you think is most important to make good use of the knowledge gained from big data analytics?	Good quality data, Master data governance, right technology in place Implementing new system replacing with new HANA system Big cleanup, lot of solutions don't get used Difference between old and new system LSA/LSA++	Innovative mentality in order to interpret data Q1.2.1You need creativity someone to interpret numbers and you need someone able to do the analysis Q1.2.1Data Quality, big sample is important, in order to detect trends	"It's a new thinking, we can't approach the big data environment with our old reporting paragons" "Once people start to see the benefits, you will get the adoption" Q1.2.1 Adopt behavior, "We have to act like a start up"	Basket analysis, Convenience, location based reporting to compare different locations Trust in data Data completeness, data quality Q.1.3.2. "To be able to - at any point in time - easily access the information is an important thing"

Row		#5 Solution Architect	#6 IT Top Management	#7 HR Analyst	#8 HR Analyst	Findings	Categories
1	**RQ1: What are the factors that affect the transfer of knowledge created by big data analytics?**						
2	**SRQ 1.1** What knowledge is transferred between employees within the organization?						
3	1.1.1. Who uses knowledge gained by big data analytics?	Big data buzzword for [this company] Starting to build the base for big data analytics "We have not adopted Big Data yet" 600 retail sites, huge amount of data produced Over 100 users	"Maturity of organization in terms of reporting, to what extend do you rely on reports and to what extend are the reports standardized across the organization." "In theory everybody should be using it within the organization, the primary reason for that is, that if you can start getting business-performance information through to staff members and not any management the probability that they can do something with it is a lot higher." If you are looking at management decisions made by different layers in your organization about 20% of your decisions are made by your senior management and executive team, that means that 80% of your employees could be making very valuable management decisions, if they were given access to the right data." Also people on the ground are more likely to find patterns, esp. regarding predictive analytics, finding trends etc. Act like a start-up Role of a CIO is preemptive	Managers for decision making	HR managers, HR GM, certain functional managers	Depending on maturity of the organization potentially everyone could use knowledge gained by BD.	Usage
4	1.1.2. What information do you access regularly?	Sales data, Turnover data, Income data	Reporting information, historic reporting -> Financial, Operation, Health safety environment, People (Performance, Talent management) Target is going towards predictive environment	HR - personal information, expenses, overtime	Manpower analytics, performance management details, rewards and compensation details, organization structure, accounting data	Dependent on the person's area of work, different analytic areas are accessed.	Usage
5	1.1.3. Which knowledge do you rate as most important for your job?	"Realizing the potential of the information, that itself is a whole different skillset"	Historic reporting vs insight Customer experience and operative excellence	Analytical thinking, math, graphs, excel Data - HR Data for her Data is correct, garbage in garbage out	Knowledge of where data comes from, what are the inputs to the outputs Understanding how the numbers get created	Business understanding and knowledge on how to analyze data are important and needed for insight.	Support and Training
6	1.1.4. What knowledge do you inform colleagues with?			Show colleagues the costs how much a department costs	"We don't do enough of it" Workforce by category, HR numbers	Information gained by BD analytics is mainly passed on by standardized monthly reporting or delivered on request.	Usage
7	**SRQ 1.2** What does support the transfer of knowledge gained from big data analytics within an organization?						
8	1.2.1. Who do you think is most important to make good use of the knowledge gained from big data analytics?	"The key users would be obviously the business leadership, they need to recognize the advantages that come behind through the adoption of analytical tools" IT leadership Users with skills that discover patterns and trends etc. "Almost like looking for nuggets"	In the past business analyst, are they part of IT or business? Data scientists or can you take your own people(citizen scientists)? Where to position that people? Best into division? "So to me that's the transition. The transition is from business analyst, through to citizen scientists, and then in future getting to all employees where you can start saying everybody can contribute to insight in an organization." Get the right people into the right positions	Line managers, general managers and the CEO Each individual as well	HR Managers, Face of HR to the business Presentation of solution Q1.3.2. Need more push for the solution	It is important to gain business leadership support, which is gained by having management recognize the value. For a good use of BD analytics individuals with the right skills are needed to gain insights.	Perceived value
9	1.2.2. What do you think is most important to make good use of the knowledge gained from big data analytics?	Discovery data or just get data delivered Skill - Interrogating the data understanding it Q.1.2.2.High degree of business understanding, and data scientist kind of skills Q.1.2.2.Change Management Q.1.2.2.Important to have the right skills	"Put people into position that are passionate about data and analytics" "Giving them the right tools, giving the things that makes them excited, and I think if you get that right, it is part of the solution." Wrong people in wrong position affect adoption "You (IT leadership) need to have the insight to say this technology is now at a point of maturity that it can be adopted by my organization and that adoption cycle is going to be 6 - 8 - 12 months" Q1.1.1."The first point of departure has to be around the accuracy of the data of the organization" Q1.1.1."And therefore can people rely on your data" Q1.1.1. Important to have real time data Q1.2.1 You almost need to get to a point where you deliver some value for people to see that there is value in what they are getting, and then they will start supporting and say ok let's get the people there" Q1.2.1. Need to keep up with the speed of change	"They want to see what we are spending and where can they save." -> users need to see the purpose/reason of using the system	An understanding of how the data understanding supports the decision making "The system, the data must guide them" "We need to do a lot more knowledge transfer, to teach them, what is available? how they can use it? We are not yet on that maturity level." It's more a pull factor than a push factor, they need to ask for training. Q1.2.2. Not yet the maturity level that lower management (line manager) can check data Q2.1.1 A lot of training necessary	In order to make use of BD analytics a high data quality must be achieved. To gain insights out of BD analytics the users must be trained in what is available and how to use it. In order to access knowledge gained by BD it is important to place individuals with passion for data and an innovative mentality and creativity into the right position.	System Support and Training

Row		#1 BI Specialist	#2 Retail Manager	#3 Analytics Manager	#4 BI Specialist
10	**SRQ 1.3** What are the challenges experienced in the transfer of knowledge within the organization?				
11	1.3.1. What makes it difficult to access the knowledge you need for your work?	Motivation decrease during time, important to develop fast Communication line during journey, SCRUM approach	Up to date data, target real-time! Lack of resources / skills "Somebody needs to make to make sense what's coming through and then tell a story about it" Q1.3.1. Data Quality: "I might be able to run a report but I'm not sure whether it is a 100% of the story or 99%" Q1.3.1. "I find it quite technical [...] this is not really my space. I rather ask somebody else to do it for me, because chances are if I try it I get it wrong, because I don't feel that confident to dot it in the first place, I'm not technical skilled to build something out of it []" Q1.3.1. But limited capacity for help Retail acts quickly; "It feels at time disempowering if you want to look at something but you can't get it or you get it and it's late" Q1.3.1. Troubles to maintain data quality and importance and possibilities to do it better Q1.3.1. 1% wrong is already huge Q2.1.1 wish for mobile independent environment	Governance (role definition) Technology gets in the way "Once user use it more frequently that hurdle [technological difficulties] will go away" Data needs to be actual	Receiving of the data Outside party collect the data, because the sites are not [this company] owned Static reports going out, no analysis "The training of the users in the tools that are out there would definitely help to transfer the knowledge better in the organization." Q.1.3.2 Mobile environment is missing Q.1.3.2 "Convenience Managers they are not sitting in the office here, running the reports, they are out there"
12	1.3.2. What knowledge are you missing for your work and what stops you from accessing it?	Data from machines, IOT		Q1.1.3 "We have to move from the reporting paragon, which is effectively looking back to a forward looking view." Q1.2.1 Loyalty information is missing Q1.3.1. Social media data is needed but not accessible yet Q1.3.1.Loyalty program	Q1.1.2. "Our end-users using the data in a fixed way, they are not analyzing to a level for prediction or basket analysis" Q1.1.2. "In [this company] we are still young" Q2.2.2. Predictive analytics is where we want to go
13	**RQ 2: How can the knowledge created by big data analytics be transferred amongst employees?**				
14	**SRQ 2.1** How are the information and knowledge made available within an organization?				
15	2.1.1. What possibilities are available to access information and knowledge in the company?	BO, Universe Designer, TankMaster	system and help from BI department Performance is important!	Talk about loyalty, and car type data	Portal to access reports SAP Queries Change to SAP Hana BI Launchpad and Analysis for Office Lumira, Story book kind of tool Dashboards -> mainly Excel Spreadsheets
16	2.1.2. What do you think are the advantages or disadvantages of the previous mentioned possibilities?	Real Time, Real time also impact productive environment, accessioning unstructured data e.g. Hadoop	Importance of Big data solutions, "The advantages I think are endless" Change management is important Information needs to be connected, example school holidays with sales		Advantage: Users want to have data in Excel and have it now with the new approach Disadvantage: Portal reports, when downloaded don't allow anymore slicing and dicing Lumira really brilliant for story telling Predictive analytics still not used "We only using this information on a monthly basis rather than doing it more often, although the information is there"
17	**SRQ 2.2** How is needed knowledge transferred within the organization?				
18	2.2.1. How do you access the information needed for you work?			Competitor information	
19	2.2.2. How do you pass on knowledge gained by big data analytics?		Q1.2.2 Feedback need to go to management committee in order to spread knowledge - hierarchy to transfer knowledge		Monthly reporting Lumira
20	2.2.3. How do you know who needs to know what?	business comes, gets a questionnaire to answer, ASAP approach	Monthly reporting, push information Adhoc reporting, people knock at the door with questions	"They come to us, tell us what they want to know" Close collaboration with users Strategy workshops at the beginning of the year	"That is difficult" "At the moment in [this company] you only know who needs to know what when they ask for it." "But what you typically need to do is to go sit in the business for a day or two with what they are doing and that way you will work out what they will need and how they need it" "A lot of times we as the BI team are missing opportunities because the business does not know what we can provide and they don't ask the right person maybe"

Row		#5 Solution Architect	#6 IT Top Management	#7 HR Analyst	#8 HR Analyst	Findings	Categories
10	**SRQ 1.3** What are the challenges experienced in the transfer of knowledge within the organization?						
11	1.3.1. What makes it difficult to access the knowledge you need for your work?	Skills - Very good understanding of business and technology, curiosity for data Q.1.3.2Training is a barrier, Business knowledge is a barrier Q.1.3.2Talk in the language of business, avoid tech talk	Q1.1.1. "Oil and Gas is working retail, convenience, distribution, manufacturing - which is a lot slower - and then upstream production. Each of those environments has a different pace." The cleanliness of the data "You not gonna do great analytics if you don't have great data." Technology needs to deliver performance as well Q1.2.1 Problem: Until you deliver something of value there is no acceptance	The system: performance, data quality Q.1.3.2 Need of more flexibility, can't make changes without an developer	Don't see the value "But instead of using the analytics as an enabler to help them along" "Don't rub it enough under there noses" "There is one at least that is quite passionate about getting to know it well because now he sees the need for it, but he is an accountant by nature."	Depending on the field of application data is available too slow. Technology is too difficult and support is needed. System are not available on mobile devices. System performance is too slow.	System Support and Training
12	1.3.2. What knowledge are you missing for your work and what stops you from accessing it?		Most organization have transactional information "So I think what's missing to me is the integration of the unstructured data." Challenge is where is the unstructured data and how do we integrate them? Operational effectiveness and increasing revenue	Predictive analytics missing in HR space		Predictive analytics are missing. Unstructured data is missing.	System
13	**RQ 2: How can the knowledge created by big data analytics be transferred amongst employees?**						
14	**SRQ 2.1** How are the information and knowledge made available within an organization?						
15	2.1.1. What possibilities are available to access information and knowledge in the company?	Maturity of organization Q2.1.2 Through the system		BW Can be made available on portal screen	SAP BW HR Users are not heavy into analytics SAP Lumira - more dashboards, storyboards Advantage - they will be independent Disadvantage - "They are draining us for the data" "They like the concept of phone and get a report"	Managers use the system or ask analysts to get the results. Information from BD is accessed by different reporting tools.	Usage System
16	2.1.2. What do you think are the advantages or disadvantages of the previous mentioned possibilities?			Daily can see by them self what happens in the system, don't need to phone		The current environment is seen very positive and with lot of expectation, independent report access is possible.	Perceived value
17	**SRQ 2.2** How is needed knowledge transferred within the organization?						
18	2.2.1. How do you access the information needed for you work?					Covered with other question.	
19	2.2.2. How do you pass on knowledge gained by big data analytics?			I would like to do it (but no time)... it is done with the system		Covered with other question.	
20	2.2.3. How do you know who needs to know what?	"It's by understanding customer requirements, it's by understanding the challenges that exist in the business, it's by understanding the business strategy."	"It all depends on where your pain points are." Strategic vision leadership is needed, not pure focus on operations	HR are main customers and maybe give permission for others to see it. So people ask for it.	By requests "Teach them to fish" "The biggest need I find they have, is the need to be trained" Lots of requests which should by solved by the users themselves	Individuals have to actively communicate their needs and requirements.	Usage