How big data analytics affect decision-making

A study of the newspaper industry

Master's Thesis 30 credits
Department of Business Studies
Uppsala University
Spring Semester of 2017

Date of Submission: 2017-05-29

Filip Björkman
Sebastian Franco

Supervisor: Leon Caesarius

Abstract

Big data analytics is a topic that is surrounded by a lot of enthusiasm and hype among both researchers and practitioners and is quickly being applied in different industries. The purpose of the thesis is to investigate the emerging technology of big data analytics and how it affects decision-making. In order to investigate this, we conducted empirical research in the newspaper industry, which is an industry that is going through a crisis with decreasing revenues, old business models collapsing, and loss of traditional news jobs, which is causing the industry to turn to big data analytics as a way of staying competitive. A nationwide newspaper, a nationwide targeted newspaper, and a local newspaper were studied in order to find similarities and differences between them and conduct an industry analysis. The findings indicate that the further the organizations have come in their work with analysing and disseminating big data analytics, the bigger was the effect on the decision-making. It was found that decision-making is becoming more transparent, accurate, efficient, and to some extent faster. Furthermore, big data analytics had outcomes on the roles in the studied organizations. It was found that the editors are becoming more like hybrids between analysts and editors, and journalists are given more responsibility and becoming more like multi-journalists.

Keywords:

Decision-making, Big data analytics, Knowledge dissemination, Newspaper industry, Outcomes, Data-driven journalism, Data-driven organizations, Roles, Routines

1. How big data analytics affect decision-making ---- 3

1.1 The newspaper industry in crisis ---- 4

1.2 Purpose ---- 5

1.3 Research question ---- 6

2. The world becoming data-driven ---- 7

2.1 What is big data? ---- 7

2.2 What does big data mean to organizations? ---- 8

2.3 What does big data mean to newspaper organizations? ---- 8

2.4 Knowledge dissemination of big data analytics ---- 9

2.5 Decision-making becoming data-driven ---- 10

2.6 Organizations becoming data-driven ---- 12

2.7 Journalism becoming data-driven ---- 14

2.7.1 Traditional journalism ---- 14

2.7.2 Data-driven journalism ---- 15

2.8 Analytical framework - our study lens ---- 16

3. Method ---- 18

3.1 Pre-study ---- 18

3.2 Study context - Nationwide – Nationwide targeted - Local ---- 19

3.3 Semi-structured interviews and observations ---- 21

3.4 Operationalization ---- 24

4. The newspaper industry adapting to change ---- 25

4.1 Nationwide newspaper ---- 25

4.1.1 Big data analytics ---- 25

4.1.2 Dissemination ---- 27

4.1.3 Decision-making ---- 28

4.1.4 Outcomes ---- 29

4.2 Nationwide targeted newspaper ---- 29

4.2.1 Big data analytics ---- 30

4.2.2 Dissemination ---- 31

4.2.3 Decision-making ---- 31

4.2.4 Outcomes ---- 32

4.3 Local newspaper ---- 33

4.3.1 Big data analytics ---- 34

4.3.2 Dissemination ---- 35

4.3.3 Decision-making ---- 35

4.3.4 Outcomes ---------- 36
4.4 Summary of empirical findings ---------- 38
5. Analysis of our theoretical and empirical findings ---------- 39
5.1 Industry ---------- 39
5.2 Big data analytics ---------- 40
5.3 Dissemination ---------- 41
5.4 Decision-making ---------- 42
5.5 Outcomes ---------- 43
6. Conclusions ---------- 45
6.1 Contributions ---------- 46
6.2 Limitations ---------- 47
6.3 Future research ---------- 48
References ---------- 49
Appendix ---------- 55

1. How big data analytics affect decision-making

"Information is the oil of the 21st century, and analytics is the combustion engine."
- Peter Sondergaard

Big data has been a buzzword during the last decade, mainly due to the reason that it provides an unparalleled opportunity to extract information that can lead to increased business results (Gandomi & Haider, 2015; EY.com, 2014; Kościelniak & Puto, 2015). This is causing organizations to invest in big data analytics capabilities in the pursuit of gaining competitive advantages (Corea et al, 2016; Waller & Fawcett, 2013). Organizations are becoming data-driven and instead of asking "what do we think" start asking "what do we know" (McAfee & Brynjolfsson, 2012). This new accessibility to insights derived from big data analytics is arguably changing the competitive nature in many industries and the traditional decision-making in organizations. Decision-making has long been characterised by the intuition and expertise of decision-makers, but when incorporating data in the decision-making it can lead to better-informed decisions (Anderson, 2015). As such, El Houari et al (2015) argue that big data enables a whole new way of producing knowledge in organizations. Today, organizations have an opportunity to excel if they successfully manage to make sense of this newly produced knowledge and thus extract value from big data analytics. Being able to make this shift will divide the winners from the losers in many industries (Cukier & Mayer-Schoenberger, 2013; Henke et. al., 2016).

However, it is not enough to simply conduct an analysis of data, it has to be efficiently disseminated to the people in the organization in order for it to influence decisions and thus put data instead of intuition at the heart of the decision-making processes (Bédier et. al., 2014). It is all about getting the right knowledge, to the right people, at the right time, in order to make better decisions (Schrage, 2016). As such, big data comes with big promises, and its effect on decision-making have been studied by several scholars, with McAfee & Brynjolfsson (2012) as frontrunners in the managerial perspective. However, due to the fact that it is a relatively new phenomenon and research area, more empirical studies in specific industries are deemed necessary to contribute to the research of what effect big data analytics has on decision-making.

1.1 The newspaper industry in crisis

The newspaper industry is going through a crisis. The industry has, and is, facing problems such as old business models collapsing, uncertainty about new funding models, local press shutting down, limited growth and loss of traditional news jobs (Peters & Broersma, 2016; Collis et. al., 2009). In the last 15 years (since 2014), the readers of daily newspapers in Sweden decreased from 75 % to 56 % (Nygren & Althén, 2014). The decrease is particularly noticeable in print newspapers as the evening press lost 13 % of its print readers in 2016 alone (Orvesto, 2016). The decrease in readers is correlating with a loss of traditional print advertising income. Even though a lot of newspapers have managed to maintain a profitable digital advertising business model in the last decade, competitors such as Google and Facebook are taking larger shares of the total amount of money spent on advertisement today (Wahlund et. al., 2013). An effect of this loss of income has been that a lot of newspapers have been forced to shut down their operations and severe downsizing have taken place, especially in local news organizations. Only in 2013, 400 journalist jobs disappeared and 38 local newsrooms were shut down (Nygren & Althén, 2014). In the Swedish region Skåne, one of every fourth journalist has lost his/her job since 2011, and in Sweden overall about 10 % of all newsroom personnel was let go in 2012 (Medievärlden, 2013).

Traditionally, newspapers have gained up to 60 % of their income from advertising, which means that maintaining a profitable advertisement business model is fundamental for all newspapers. The fact that new competitors are increasing their share of the total advertisement are striking the newspaper organizations hard and forcing them to find new business models to increase their income (Nygren & Althén, 2014; Collis et. al., 2009). A common business model is to start charging the readers for digital content that previously has been free to consumers (Melesko, 2013). This is challenging because nobody would expect getting a newspaper in a store for free, but at online platforms, consumers are expecting the content to be free of charge. Changing this consumer behaviour is not an easy task and organizations are struggling with how to adapt and stay relevant and attractive for their readers (Bédier et. al., 2014; Stone, 2014).

The industry has during the past decades endured several disruptive innovations (Bower & Christensen, 1995) such as going from print to digital and incorporating mobile platforms into their product offering (Bédier et. al., 2014). A way of adapting to the most recent change,

where newspapers are losing readers at the same time as the readers are expecting to get content for free, is by analysing consumer behaviour and using insights to customize more relevant news and thus convert free content readers to subscriptions. The solution is spelt: big data analytics. This provides an unparalleled opportunity to, instead of guessing what the readers want, actually know exactly what they want. With big data analytics, news organizations can track all interactions with their readers, analyse patterns, detect preferences, and link that information to the delivery of customized and personalized news content, which customers are prepared to pay for (Hammond, 2015; Pence, 2014; Evens & Van Damme, 2016).

1.2 Purpose

The newspaper industry is going through a crisis and is fighting back with the help of big data analytics. This arguably makes the newspaper industry a frontrunner in the field of big data analytics and is also making it a suitable setting to conduct research in. The purpose of the thesis is to investigate how big data analytics affect decision-making with the newspaper industry as an empirical example. This will increase the understanding of how big data analytics is affecting decision-making in the 21st century and more specifically what implications it has for newspapers. Previous research has mainly focused on either big data related to decision-making (see McAfee & Brynjolfsson, 2012; Anderson, 2015), knowledge dissemination of big data analytics (see Kingston, 2012; Erickson & Rothberg, 2005) or journalism becoming data-driven (see Hammond, 2015; Bédier et. al., 2014). The combination of these research areas has not been studied before. Hence, there is a theoretical research gap of what effect dissemination of big data analytics has on decision-making when applied to the newspaper industry. The changes the industry is currently trying to adapt to, the fast decision-making in newsrooms, and the ability to derive advanced insights about readers from big data analytics are combined making the industry an interesting setting to conduct research in. Within the setting, two perspectives become of significance: the production and dissemination of knowledge and the end users receiving and acting on the knowledge. How organizations are using big data analytics as a way of adapting and what effect it has on both decision-making and other outcomes for organizations becomes of interest. We aim to achieve the purpose of investigating how big data analytics affect decision-making by exploring the research question:

1.3 Research question

How does dissemination of big data analytics affect decision-making in the newspaper industry?

In doing so, the study will be of interest for:

1) Managers, editors, journalists and other employees in newspaper organizations trying to adapt to changes in the industry.
2) Managers in organizations from all industries looking to incorporate big data analytics into their decision-making.
3) Organizational scholars wanting to expand their knowledge in the dissemination of big data analytics and its effect on decision-making.

2. The world becoming data-driven

2.1 What is big data?

Big data has become a popular term to describe the exponential growth, availability, and use of information and is often explained by Laney's (2001) three V's: Volume, Variety and Velocity. Hence, big data is characterised by huge amounts of data, coming from a variety of sources, with a high speed of generation. This kind of data is incorporated into our daily lives as most people use it indirectly every day, whether it is searching for something online or reading an article (EY, 2014). As such, big data is working in the background and enables organizations to analyse an unprecedented amount of information (Henke et. al., 2016). Every day, we create over 2.5 quintillion bytes of data, which is so big that 90 % of the data in the world today have been created in the last two years alone (IBM, 2017). Hence, the volume of the created data constitutes the backbone of big data (Baro et. al., 2015). With such massive amounts of data being generated, being able to capture it efficiently in high speed and derive real-time information is vital for organizations today (Turban, 2015; Gandomi & Haider, 2015; Sharda et. al., 2014; LaValle et. al., 2011). It is when organizations actually use data in their decision-making that they are becoming data-driven (Anderson, 2015).

Furthermore, big data can be divided into two categories, structured and unstructured data (Turban et. al., 2015; EY.com, 2014; Hand, 2007; Stone, 2014). Structured data refers to the data that is already filtered, has a predictable format, and is defined by a set of rules. With unstructured data, there are no rules and as such it does not have a predictable format. Sources of unstructured data may be social media, text, photos or videos (Sharda et. al., 2014; Turban, 2015). This variety of sources makes the data unmanageable for traditional processing (Kościelniak & Puto, 2015; Waller & Fawcett, 2013; Pence, 2014). What separates big data analytics from traditional data processing is the difference in information, technology, and analytical tools required to make proper use of the information to derive insights (Mohanty et. al., 2013; Brynjolfsson et. al., 2011; Sharda et. al., 2014; De Mauro et. al., 2016; LaValle et. al., 2011). Analysing greater streams of data will increase the chances of detecting patterns and interesting anomalies than traditional data streams. As big data is approximately 80-90 % unstructured, making sense of the unstructured data is vital for organizations in order to derive insights from the information they gather (EY, 2014; Kościelniak & Puto, 2015;

Waller & Fawcett, 2013). Due to this, Mohanty et. al., (2013) argue that analysing unstructured data is the fundamental concept of big data.

2.2 What does big data mean to organizations?

The ability to make sense of unstructured data through analytics enables organizations to incorporate valuable insights about their business into their everyday routines, processes and decisions. This likely means that organizations need to gather data, analyse it, turn it into insights, and then make sure that the insights are acted upon (Anderson, 2015). If this is done efficiently, organizations can gain competitive advantages from being well-informed about their business and possibly increase their performance (Brynjolfsson et. al., 2011; Marr, 2015). Hence, big data basically gives organizations an opportunity to be more competitive. However, these opportunities do not come without challenges, as both McAfee & Brynjolfsson (2012) and Pearson & Wegener (2013) argue, big data is not just a technology initiative. It is a business process that requires technology. In order for big data to achieve its full potential, it must be incorporated into organizations strategy and decision-making. Thus, in order for organizations to capture the true value of big data, they must re-define their processes and way of doing things (McAfee & Brynjolfsson, 2012; LaValle et. al., 2011; Shah et. al., 2012). Because of the amount of data being generated and the knowledge gained from that data, El Houari et. al. (2015) argue that big data is fundamentally a new way to gain knowledge in organizations. Being able to utilize the knowledge gained through big data analytics will enable organizations to make faster and better decisions, and the biggest obstacle they will be facing is to incorporate the data-driven insights into their day-to-day business processes (Mohanty et. al., 2013; McAfee & Brynjolfsson, 2012; Pearson & Wegener, 2013; Henke et. al. 2016).

2.3 What does big data mean to newspaper organizations?

An industry that recently has adopted big data as a way of staying competitive is the newspaper industry (Bédier et. al., 2014). Newspapers have been trying to understand their reader preferences for decades. However, analysing consumer behaviour in print formats have been an issue for the industry due to difficulties in measuring it (Hammond, 2015; Bédier et. al., 2014; Harrower, 2010). Since newspapers today offer their product in digital formats they can more easily gather and analyse data about their readers. Big data thus enables the

possibility to derive insights from sources with unstructured data, which previously was impossible due to technical limitations (Stone, 2014). As organizations, and especially newspapers, have overcome the technological thresholds to make sense and analyse unstructured information, they are able to combine their insights to decode the meaning of their interactions with their readers, analyse patterns and detect preferences, and link that information to the delivery of customized and personalized news content (Hammond, 2015; Pence, 2014). For the industry, this means an unparalleled opportunity to observe and analyse their customers' (readers') actual behaviour (Bédier et. al., 2014). The possibility to dig into aggregated data of their website traffic and trace connections between individuals and patterns, enables newspapers to derive insights of user preferences. This means a new lens for understanding patterns and reason (Reid & Frankel, 2008). This is possible due to that big data allows newspapers to capture readers' every action on their website, even down to the smallest scroll or click, which leaves a trail of data (Bédier et. al., 2014).

Thus, big data analytics enables, what until recently was impossible, the ability to know exactly what readers want. This basically means that the newspaper industry is able to find out what to write, for who, and when and where to publish it. As such, newspapers today, in the era of big data, do not have to guess (Hammond, 2015). They will be able to make decisions with higher accuracy based on the knowledge of big data analytics and thus the competitive landscape in the newspaper industry will change (Pence, 2014). A prerequisite for this is that the insights derived from big data analytics are efficiently disseminated within the organization. Only then will it assist newspapers in navigating in the newly available quantity of data and make better decisions (Latour, 2011).

2.4 Knowledge dissemination of big data analytics

Kingston (2012) argues that knowledge dissemination is the process of distributing knowledge to those who need it, which is necessary in order to reap the fruits of successful big data analytics. But in order to disseminate knowledge, you must first transform the data collected into actionable knowledge (Anderson, 2015). As such, there is a difference between data, information, and knowledge. Data is the rawest source of information, like for instance observations, and when filtered and put into a context it becomes usable information. When that information is subjected to experience, reflection or acted upon, it becomes knowledge (Awad & Ghaziri, 2004; Erickson & Rothberg, 2005). In the newspaper industry setting, this

means that knowledge is created when big data analytics reaches the editors and journalists and they in some way act upon it. According to Sharda et. al (2014) the dissemination of knowledge is an active process to communicate, (in this case big data analytics) to a targeted audience (in this case editors and journalists). The message should be clear, simple, and actionable in order for the end-user to be able to make a decision. This is, due to the fact that some analytical tools are too complex for the end-users to understand.

In order to maximise the potential impact of big data analytics, organizations must have processes for getting the right knowledge, to the right people, at the right time (Schrage, 2016). In the newspaper industry, it means that you are likely to have some sort of system for gathering data, turning it into insights, and disseminating this as actionable information to editors and journalists. Without accessibility to data and comprehensible and action-oriented analyses, the work with crunching data will not result in the desired value. Being able to disseminate real-time data is particularly important in the newspaper industry since it is characterised by rapid decision-making (Bédier et. al., 2014). Hence, strategies for making use out of patterns from readers and making it instantly accessible for people in the organization is vital. It is the real-time dissemination of specific information about what stories the readers desire and the performance of published articles that can be argued as changing the way editors and journalists work, at least in theory (Hammond, 2015; Pence, 2014). Furthermore, according to Bédier et. al. (2014), the dissemination of specific information is for most newspapers a challenging aspect as the process of sharing the information is a more complex process than the process of capturing information. Developing effective knowledge sharing processes is a key for assisting the newspapers in their effort to become more data-driven in their decision-making.

2.5 Decision-making becoming data-driven

If big data analytics is disseminated efficiently to editors and journalists it will likely have some kind of impact on their decision-making (Anderson, 2015; Hammond, 2015). Whether they act upon the insights or not and what implications it has on their work is arguably situational. Captain Edward Smith of the Titanic was known to be both competent and smart, yet he ignored warnings of an approaching iceberg and went onward, causing one of the most well-known disasters in history (Kasprzak, 2012). There are countless examples of presumably smart people making bad decisions. Why is this so common one may ask? Simon

(1957) is famous for introducing the theory of bounded rationality. In order to make the best decisions, people should follow a rational process every time they make a decision. However, in reality, it is very seldom the case, as people are affected by factors such as time constraint, information overload, laziness etc. Simon argues that human judgment is therefore bounded in its rationality and that we can better understand decision-making if we study actual decisions rather than prescriptive decisions. Stanovich and West (2000) divides human decision-making into System 1 and System 2 thinking. System 1 thinking is based on intuition, which is decisions made fast, automatic, effortless, implicit, and emotional. System 2 thinking, on the other hand, is more rational and is characterised by consciousness, effort, explicitly, and logic. Most of our decisions are made with System 1 thinking even though System 2 thinking in many cases would lead to better decisions.

The System 1 type of decisions is not only made by humans in their everyday life, but also in their professional setting. Organizational decision-making has traditionally been guided by the expertise and the intuition of those who are perceived as experts (Bazerman & Moore, 2013). The newspaper industry is a good example where expertise has traditionally guided the decision-making process (Nikunen, 2013). The actual news has of course always aimed to be objective, but the process of selecting what to cover and what the readers want has been decided by editors' intuition (Bounegru, 2012). An expertise based intuitive decision-making process is heavily reliant on that the decision-makers are very well aware of their own capabilities, and just like Captain Edward Smith with the Titanic, this may prove to be a risk for organizational well-being. In more recent literature (McAfee & Brynjolfsson, 2012; Andersson, 2015), Captain Smith would be described as a HiPPO (Highest Paid Person's Opinion). A HiPPO is the antithesis of data-drivenness, who overrides what the data says if it is not corresponding with his/her own intuition. Even though expertise and intuition is valuable, it is argued to lead to less informed decisions than decisions based on data (Salas et. al., 2010; McAfee & Brynjolfsson, 2012). Hence, the HiPPOs in organizations can be just as deadly as an iceberg for businesses, as it does not matter how good analyses you conduct if it is just going to end up as an unread report by a decision-maker whose mind has already been made up (Anderson, 2015).

Figure 1. HiPPO (Anderson, 2015).

Human bias indeed seems to be a problem within decision-making. This also applies to the newspaper industry that has to do everything it can to stay relevant for its readers (Bédier et. al., 2014), as the industry is going through a disruptive innovation as previously argued (Bower & Christensen, 1995). With the emergence of computer technology and more recently big data, organizations can shift from System 1 thinking to System 2 thinking, hence make better decisions (Bazerman & Moore, 2013). Marr (2015), McAfee & Brynjolfsson (2012), Gandomi & Haider (2015), Kościelniak & Puto (2015), and Waller & Fawcett (2013) all argue that big data offer organizations an unparalleled opportunity to extract information that can lead to increased business results. Ideally, data-driven decision-making results in more agile organizations where decisions are made lower down in the organization, will lead to faster decision-making, and more empowered employees (McAfee & Brynjolfsson, 2012; Schrage, 2016; EY, 2014; Henke et. al., 2016). If this is achieved, the decision-making can be argued to move from the elite few (HiPPOs) to the empowered many (Anderson, 2015; IBM, 2017).

2.6 Organizations becoming data-driven

For an entire organization to actually be data-driven, the previously described decision-making should be present at all different levels of the organization and they should employ a

culture where analytics guide all decision-making (Barton & Court, 2012; Kiron, 2017). According to Anderson (2015) many organizations want to be data-driven but few actually are. This goes in line with the reasoning of McAfee & Brynjolfsson (2012), who argue that after implementing the technology necessary for big data analytics, a greater challenge of adjusting and re-defining processes within the organization will arise, and thus conclude that big data is rather a management revolution than a technical one as previously argued.

So what defines a data-driven organization? Anderson (2015) addresses the question of what it means for organizations to be data-driven. Two prerequisites are fundamental for being data-driven: collecting the right data and that the data is accessible and queryable. Barton and Court (2012) support this by arguing that data should be accessible for everyone in the organization at any time and employees should be able to act independently on the data. Furthermore, the data has to be made understandable. If somebody asks for data and gets the answer "go fish" no decisions will be based on data (Fitzgerald, 2015). In order to get valuable insights from data, Anderson (2015: 9-10) describes a sequence called the analytics value chain as following: "*... insights require collecting the right data, that the data is trustworthy, the analysis is good, that the insights are considered in the decision, and that they drive concrete actions so the potential can be realised.*"

Figure 2. Analytics Value Chain (Anderson, 2015:9-10).

If these steps are followed by organizations in their work procedures they are perceived as being data-driven (Anderson, 2015). Mitzner (2016) supports Anderson's findings and claims that insights derived from data should lead to real-time decision-making in the organization. Within this value chain, it is particularly important that the analysis is not only descriptive but also predictive and prescriptive (Anderson, 2015). This means that analyses should be forward-looking and answer W-questions such as who, why, what, when, and where, and ideally make recommendations for decision-making. Answering these questions is particularly important for newspaper organizations that have to be very flexible when

adjusting to their audience (Bédier et. al., 2014). In general, the last step of the value chain is even more important. Organizations are never truly data-driven if the analyses are not acted upon (Anderson, 2015). This is also valid in the newspaper industry as journalists have to act on the analyses given to them when they write their stories in order to argue that the organization is actually driven by data.

However, creating a data-driven organization is not uncomplicated, as transforming the organization it not something that happens instantaneously, it is a continuing process (Anderson, 2015). According to Kiron (2017), many organizations struggle to incorporate data into their everyday decision-making. This is mainly due to that managers are unwilling to change their decision-making process since they are so accustomed to act on expertise, intuition, and gut feeling. In a data-driven culture, expertise, intuition, and gut-feeling must go hand in hand with technological assets. Being truly data-driven is not only about having the right technology, but also about the mindset of all employees (Kiron, 2017; Mitzner, 2016). The vision of being data-driven must be explicitly stated from the senior management. Without their support, middle-managers and frontline personnel will not embrace and fulfil the use of analytics since their roles and responsibilities will change. Phillips-Wren and Hoskinsson (2015) support this by arguing that a data-driven organization has achieved alignment between business strategy and data-driven decision-making. Such organizations also treat data as a core asset (Kiron, 2017). According to Fitzgerald (2015), the incitement for organizations to become data-driven is that if done correctly it will help them to do things better. However, achieving data-drivenness is more than just re-defining processes. To fully reach its potential, data and analytics must transcend departments and organizational boundaries (Kiron, 2017). If done successfully, organizations can be more agile due to their data-drivenness and make better decisions. The reasons why organizations want to become data-driven are contextual, however, specific and measureable outcomes were found by Brynjolfsson et. al., (2011) who found that organizations that perceive themselves as being data-driven are on average 5 % more productive and 6 % more profitable than competitors.

2.7 Journalism becoming data-driven

2.7.1 Traditional journalism

Something has happened, then you can read about it the newspaper the next day. But what has happened in the newsroom between these events? Newspapers are traditionally governed in

quite similar ways as most organizations with hierarchies, chains of commands, and specialisation of tasks (Amnestål et. al., 2002). The newsroom consists of people with different roles and different responsibilities and includes for instance reporters, photographers, researchers, proof-readers, editors, and an editor-in-chief. Harrower (2010) argue that what all people in the newsroom have in common is that everybody applies news judgment; thinking about what news stories are most interesting and important to the readers. Traditionally, the approach to find out about this has been quite basic methods such as observations, interviews, and surveys. Reporters then use this knowledge together with their expertise to do research and write stories, and it is ultimately the editors that decide how successful the story is and if and where to publish it. Hence, a story has to go through several steps and people in the organization before it is published. Furthermore, a common denominator for everybody in news organizations is strict deadlines in order for the newspaper to be ready in (usually) the morning. The nature of this kind of work calls for fast decision-making (Ibid). Hence, the decision-making in traditional journalism relies a lot on expertise and intuition at all levels of the organization.

2.7.2 Data-driven journalism

What fundamentally distinguishes traditional journalism from data-driven journalism is the changes that technological innovations like the internet, mobile applications, and most recently big data analytics have brought with them (Bédier et. al., 2014). Although many journalists and academic scholars claim that the industry always has been driven by data, the ability to draw insights from big data is changing the way the industry works (Stone, 2014). Traditionally, journalists have had access to data and information in analogue formats such as heavy and expensive books (Hammond, 2015). What big data is enabling is not only larger datasets of information to learn from, but more importantly a faster and more accurate way of gaining the right knowledge (Evens & Van Damme, 2016). It does not only function as a way of gaining knowledge of a particular story, but more fundamentally connecting the journalism with information about the what, when, why, and where of the reader. This sort of information allows newspapers to be relevant for their readers and customize and optimize their product in a way that has not been possible before (Bédier et. al., 2014; Rubin, 2013).

These changes have outcomes for both how news stories are written by journalists and how the articles are optimized on the website, in order to be as relevant as possible for the

audience (Bédier et. al., 2014; Stone, 2014). Newsrooms all over the world are experiencing changes in their culture. The ability to track readers' behaviour online are no longer seen as snooping or something that will not provide any value for the actual articles but is instead accepted by the staff and incorporated into their daily work. Gaining insights from analytics and tracking articles performance through dashboards and other tools is now a part of the life in newsrooms (Rubin, 2013; Stone, 2014). What previously has been described as a case of shouting something out loud and hope that somebody hears it in print products, is now linked with real-time performance data where journalist know exactly what their impact on the readers is (Stone, 2014; Evens & Van Damme, 2016).

Tracking performance on every story in real-time enables journalists and editors to change headings, pictures or text based on the performance of a story (Bédier et. al., 2014). To have this kind of knowledge about your readers is fundamentally changing how newspapers make decisions (Rubin, 2013). Instead of relying on expertise and gut-feeling there is evidence at hand to assist people in the organization in order to make better decisions (Hammond, 2015). We are even moving towards decision-making in the newspaper industry becoming automated and ruled by algorithms (Miller, 2015). This means that news articles can be put together by a computer in a faster and arguably more objective way than if a journalist would write it (Levy, 2012). An example was a "Quakebot" developed by a Los Angeles Times reporter that, based on data from the US Geological Survey's automated earthquake notification service, could write a brief report (Oremus, 2014). In less than 5 minutes the story was proofread by the reporter and published on the newspaper's website. Furthermore, the content can easily be customized for specific audiences or even individual readers, which would not be practicable for human journalists (Levy, 2012). Regardless if the stories are automated and reported by computers or written by a human journalist, news reporting in an era of big data is different from traditional news reporting.

2.8 Analytical framework - our study lens

The analytical framework of the thesis builds on bodies of theory about big data analytics, knowledge dissemination, and decision-making. We argue that in order to understand the developing and complex field we study; there is a need to understand both the setting of a newspaper organization and these theoretical research areas. Thus, the thesis aims to

investigate what effect big data analytics has on decision-making through the dissemination of knowledge, with newspaper organizations as an empirical example.

The process from collecting big data to resulting in actual value for organizations can be described by the following example: A newspaper has a lot of unstructured data about its customers' behaviours on its website, search engines, and social media (big data), it analyses the data and derives insights about readers' preferences, the analysis is not only descriptive (looking at the past) but also predictive (forward looking), prescriptive (suggests an action) or even automated, these insights are absorbed and reflected upon (knowledge), the new knowledge is disseminated in real-time to the editors and journalists, and they make a decision to write an article based on the new knowledge derived from big data analytics (decision-making).

The analytical framework provides a model for gathering empirical data in the newspaper industry and then analyse it based on the previous theoretical findings. Different sub-categories within the areas of big data analytics, knowledge dissemination, and decision-making will specifically be studied (see Figure 3) and ultimately what outcomes they have on both decision-making and potentially other aspects of the organizations. With regards to big data analytics we will investigate what kind of data they gather in order to find out if it is big data or more traditional statistics, as well what kind of analyses of the data they conduct. Concerning knowledge dissemination, we aim to find out how data is shared internally to employees. The decision-making is studied by investigating if decisions are ruled by data or intuition as well as if and how the disseminated data is acted upon. Finally, we aim to find out what outcomes this has for the studied organizations.

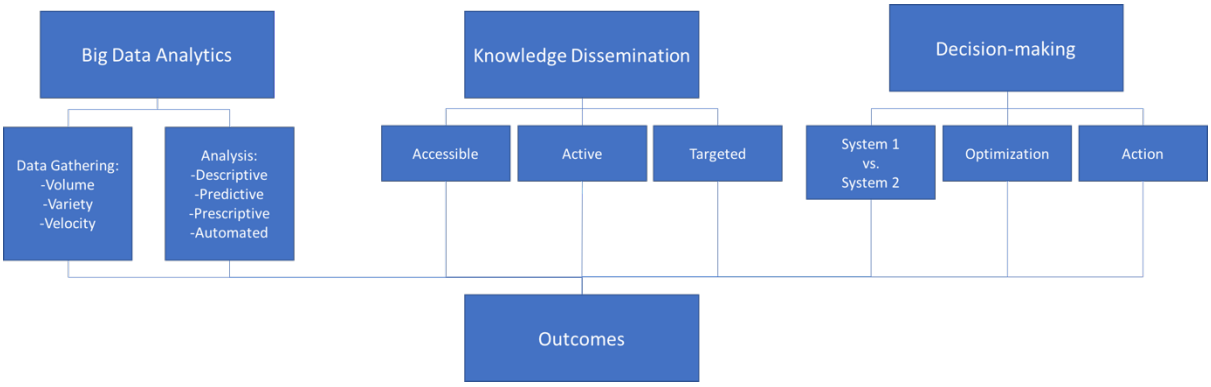

Figure 3. Analytical framework.

3. Method

3.1 Pre-study

In the pursuit to investigate how dissemination of big data analytics affect decision-making, the aim was to find a suitable industry to conduct research in. Hence, three different industries were targeted that, given our initial knowledge, potentially were conducting big data analytics that influenced their decision-making. Our choice of industries were the aerospace industry, the retail industry, and the newspaper industry. All of the chosen organizations within these industries are considered leading actors in Sweden within their respective industry. The requirements of our chosen organizations were that they captured, stored, and analysed unstructured data, and used the insights derived from analytics in their every-day decision-making (see Appendix 1 for further criteria). Interviews were then conducted with one or several persons in each organization who were responsible or affiliated with the respective organization's big data analytics.

In these interviews, it was found that all organizations collect, analyse, and use information that can be categorised as big data. An important finding was that the frequency of actual usage was the biggest difference between the organizations. In the aerospace industry, a lot of decisions are regulated by military/state and secrecy laws, and therefore they are not able to make decisions quickly. In the retail industry, our chosen organization is a front-runner in the use of big data in regards to its analytical capabilities, however, it has not yet integrated big data analytics in the decision-making in the entire organization. A factor that made these organizations less suitable to study was that they did not make analyses accessible to everybody in the organizations. In the pre-study of the newspaper industry, it was found that newspapers, in general, use a vast amount of analytics of data found in individual behaviour patterns of readers online. That data is then analysed and disseminated within the organization to people on all different levels. The industry is also going through a lot of changes and the nature of the work is characterised by fast decision-making. As such, they fulfilled the criteria of both collecting and analysing big data and then using it in their every-day decision-making. Given these circumstances, we drew the conclusion that it would be most suitable and interesting to conduct our research within the newspaper industry.

Level	Industry	Interview	Duration
Head of Analytics	Retail	Face-to-face	1 h
Manager	Retail	Face-to-face	1 h
Manager	Aerospace	Telephone	1 h
Head of Analytics	Newspaper	Face-to-face	1 h
Manager	Newspaper	Face-to-face	1 h

Table 1. Pre-study.

3.2 Study context - Nationwide – Nationwide targeted - Local

The study takes an exploratory approach (Bryman & Bell, 2007) in order to gain an understanding of how dissemination of big data analytics affect decision-making in the newspaper industry. The use of big data analytics in organizations is rapidly growing (De Mauro et. al., 2016), but the research area of big data analytics and its effect on decision-making is a relatively new area and is not yet mature. Therefore, exploration of how routines, roles, decisions etc. are changing is deemed as an appropriate research approach.

With the aim to dig deeper into the newspaper industry, three different organizations were selected as units of analysis (the organization interviewed in the pre-study is not included in this sample), and a categorization of these organizations was deemed appropriate. Due to convenience of geographical location, all selected organizations are from the Swedish newspaper industry. This means that the future findings are primarily applicable and generalizable for other Swedish news organizations, but still relevant for news organizations in other countries. As Figure 4 illustrates, a division was made of the organizations into three categories: nationwide newspaper, nationwide targeted newspaper, and local newspaper. The criteria for selecting these organizations were that they differ in reach, target audience, size, and resources. The selection and categorization was done in order to have the ability to cross-examine the findings from the different categories of organizations and find out if the effect of dissemination of big data analytics on decision-making are contextual or overall applicable to the entire industry. A case study on a single organization would have given more in-depth knowledge of the circumstances within a single organization, but not the ability to cross-examine the results (Yin, 2009). Hence, the selection of three different types of organizations within the same industry can increase the validity of the findings for the industry (Sekaran & Bougie, 2009). Since the organizations have variations when it comes to reach, target

audience, size, and resources it is interesting to look for similarities and differences between these organizations and see if these factors are determinants or not for what effect dissemination of big data analytics have on decision-making. From this sample, conclusions can to some extent be drawn for the entire industry. To fully be able to generalize the findings for the industry, more categories of newspapers would have been needed as well as a larger sample within each category.

In Figure 4, the outer circle symbolises the entire population of Sweden, which only the nationwide newspaper has as its desired reach and target audience. Moving inwards narrows the scope of reach and target audience. The local newspaper is found in the centre of the circle and the more targeted nationwide newspaper is located in the middle section of the model.

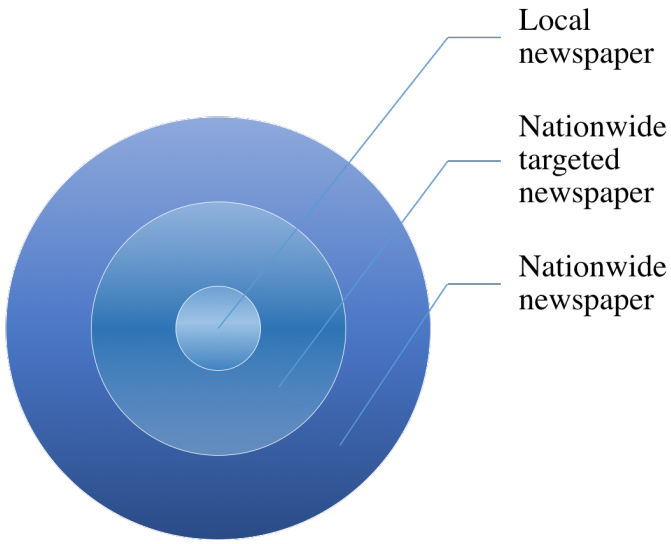

Figure 4. Categorisation of newspapers.

To gain a holistic understanding of the effect of dissemination of big data analytics on decision-making, interviewing people from three different organizational levels was necessary (see Figure 5). This enabled a within case analysis of the different organizational levels and provide depth to the research. Level 1 symbolises employees with positions such as the head of analytics or equivalent. They are generally responsible for the analytics strategy in their organizations and have technical knowledge about the work with analytics, and can thus provide insights of how their respective organizations work with big data analytics. Level 2 consists of the roles of editors or managers. They are considered as line managers and usually

the ones with the executive authority to make decisions in the newsroom. Level 3 represents the role of the frontline personnel, which in the newspaper industry is the journalists. These units of analysis within the organizations gives the research the perspectives of both the producers of knowledge and the end-users.

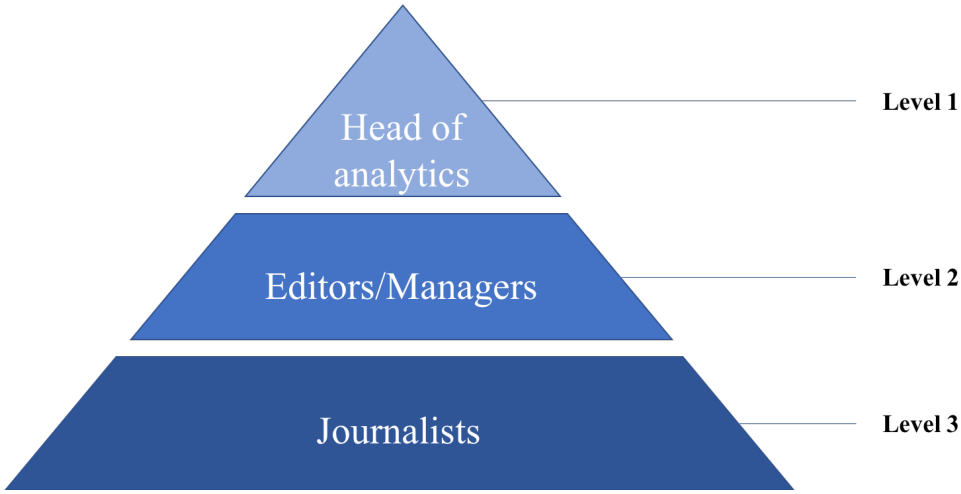

Figure 5. Categorisation of employee levels.

3.3 Semi-structured interviews and observations

The method for data collection was qualitative interviews with four employees from each organization. As previously discussed, these four employees represent different levels of the organizations to get the perspective of both producers of big data analytics and end-users. This increases the validity of the findings of how dissemination of big data analytics affect decision-making in the entire organization, not just for a specific role. The form of the interviews was semi-structured interviews due to the fact that it offered a wider range of options than structured interviews and more stability than unstructured interviews (Kvale, 1996; Holme & Solvang, 1997). This was deemed appropriate in order for the interviews to stay within the context of the research (Saunders, 2007). Furthermore, this approach was suitable since the thesis is exploratory, which requires obtaining in-depth knowledge from the interviewees (Blumberg et. al., 2011). Sekaran and Bougie (2009) argue that the best way to obtain in-depth knowledge in an exploratory thesis is by interviewing persons of interest. In line with the semi-structured approach, the same set of predetermined questions were used in all interviewees, which gave initial structure but also offered the ability to vary the follow-up

questions in order to get the most feature-rich answers in relation to the research question (Saunders et. al., 2007; Sekaran & Bougie, 2010; Robson, 2002; Kvale, 1996). Hence, the same basic questions (see operationalization) were used for all organizations, but the order of them and the follow-up questions were adapted to the specific role of the respondent and in which direction the interviews were going. Furthermore, the use of predetermined questions as a foundation allowed cross-examination of the answers (Sekaran & Bougie, 2010). That being said, the research approach of semi-structured interviews requires critical awareness towards the empirical data collected during the interviews since the respondents' individual perceptions and answers can be distorted (Silverman, 2006).

The choice of setting for the interviews was decided upon convenience with the respondents to guarantee that they were comfortable (Saunders et. al., 2007). The majority of the interviews were face-to-face with the respondents at their head-offices. This was suitable as it also allowed for observations of how the dissemination was done and what the disseminated big data analytics actually looked like for the end-users. It also provided the opportunity to observe the setting of the newsroom, which is the centre of decision-making in the newspaper organizations. Even though we did not observe a whole process of news coverage and decision-making, conducting these observations reduced the potential subjectiveness in the answers from the respondents in the interviews (Bryman & Bell, 2007).

Furthermore, the interviews with the journalists in all organization were conducted by telephone. This was due to convenience of the respondents and that the more extensive previous interviews had already been carried out at the head-offices with the other respondents when the journalists were interviewed. Even though this meant a lack of personal interaction (Holt, 2010), it provided us with the data we needed since we had already established a good knowledge of the actual dissemination and what data that was made accessible to the journalists in previous observations and interviews. Furthermore, all the interviews were conducted in Swedish and later translated into English. This decreased the risk of a language bias that would have occurred if the interviews would have been conducted in English. To make sure that the translations were done correctly, all quotes were sent to the respondents for approval. Another limitation with the research method was that it was not possible to specifically follow an entire decision-making process due to time-constraints of the organizations and the respondents. Instead, asking about how decisions are made within the organizations was deemed sufficient given the circumstances. In that sense, the

observations conducted were limited and served mostly as validation of how the respondents claimed that dissemination of big data analytics was conducted in their respective organizations. Although the research approach with semi-structured interviews and observations has some limitations, especially the interviews conducted by telephone, we are confident in that the method of collecting empirical data has provided us with reliable results.

Furthermore, the respondents were asked if audio recording could be used in order to give us the ability to be more concentrated without having to write down the comments made by the respondents. Using audio recording also enabled the use of direct quotes, re-listening the interviews, and proves that the process was unbiased (Saunders et. al., 2007; Sekaran & Bougie, 2010). Additionally, all organizations and respondents were given the opportunity to remain anonymous. This was done in order to maximise the chance of truthfulness in the answers as they did not have to fear any unwanted consequences of their answers (Sekaran & Bougie, 2010; Saunders et. al., 2007). Since adopting big data analytics is important for many organizations in the industry, it was also a question about not revealing sensitive or valuable information to competitors. Hence, all organizations and respondents are anonymized in the study to ensure validity.

Level	Newspaper	Interview	Duration
Head of Analytics	Nationwide	Face-to-face	1 h
Manager/Editor	Nationwide	Face-to-face	1 h
Journalist	Nationwide	Telephone	30 min
Journalist	Nationwide	Telephone	30 min
Head of Analytics	Nationwide targeted	Face-to-face	1 h
Manager/Editor	Nationwide targeted	Face-to-face	1 h
Journalist	Nationwide targeted	Telephone	30 min
Journalist	Nationwide targeted	Telephone	30 min
Head of Analytics	Local	Face-to-face	1 h
Manager/Editor	Local	Face-to-face	1 h
Journalist	Local	Telephone	30 min
Journalist	Local	Telephone	30 min

Table 2. Conducted Interviews.

3.4 Operationalization

To relate previous theory and findings in the areas of big data analytics, knowledge dissemination, and decision-making to the empirical research, an operationalization was conducted (see Table 3). The aim of the operationalization is to explore the different areas, how they are related, and ultimately what effect dissemination of big data analytics has on decision-making in newspaper organizations. The model is derived from the theoretical framework and includes both explanatory and exploratory questions in order to gain as much understanding as possible.

Categorization	Operationalisation	Interview questions
General	• What challenges are the industry facing and how are organisation adapting?	1. Introduce yourself. 2. Introduce the organisation. 3. What is happening in the industry right now? How do you adapt?
Big Data Analytics	• What is measured with big data analytics? • What type of analytics are conducted?	4. How does your organisation work with big data? 5. What data are you collecting? 6. What do you measure? 7. What type of analysis do you conduct? Descriptive, predictive, prescriptive? 8. How do you turn data into insights? 9. How do you use the insights?
Dissemination	• How is knowledge disseminated in the organisation? • To what extent is BDA made accessible to employees in the organisation? • To what extent is the dissemination targeted, active and in real-time?	10. Who in the organisation has access to data and analyses? 11. How do you disseminate BDA? 12. Would you say the spreading of BDA is more active or passive? 13. Does the dissemination happen in real-time? 14. Is the dissemination targeted to specific audiences? 15. How do different departments collaborate and spread knowledge? 16. What obstacle do you have in disseminating BDA?
Decision-making	• To what extent is the organisation data-driven in the decision-making? • How are decisions made in the organisation?	17. How do you perceive decision-making in the organisation and have this changed with the emergence of big data? 18. How many decisions are based on intuition/expertise in relation to data? 19. Do you perceive your organisation as data-driven? In what way? 20. Have you experienced changes in decision-making since you started working with big data? 21. Do you act upon generated insights? 22. What do you do if your intuition says one thing and data another? 23. What could make your organisation more data-driven?
Outcomes	• What outcomes does dissemination of BDA lead to in the organisation?	24. How does dissemination of BDA affect both the organisation and your own work? 25. Has the work changed compared to before you used BDA? 26. What impact has it had on your routines? 27. Is the roles in the organisation the same as before? 28. Has dissemination of BDA affected the way you make decisions? In what way?

Table 3. Operationalization table.

4. The newspaper industry adapting to change

4.1 Nationwide newspaper

The organization is one of Sweden's major newspapers and has been described by other organizations as a frontrunner when it comes to analysing their readers' behaviour. In their phase of adaptation to challenges in the industry, the organization has visited and discussed challenges with the leading newspapers in both the United Kingdom and the United States. In these discussions, they shared and received information on what challenges other newspapers have and how they are tackling them. A common business model in the industry is to adopt business models with either an account feature where readers can login but yet still read the news for free, or a model with paid news content. Whatever model the organizations apply, they can use big data analytics to better catch who you are and ultimately be able to offer a better experience. Big data analytics enables the newspaper to find solutions to reach out to as many people as possible with their content, stay relevant for the readers, and ultimately increase their income. Within the organization, these insights are shared within internal systems and dashboards to all members of the organization.

4.1.1 Big data analytics

The analysts in the organization have experienced an increased importance in the last few years. This can be illustrated by the fact that the analytics team has moved from being isolated furthest down in the office to being located in the front row. Today, the organization has over ten analysts working closely with the newsroom, research & development, and advertising functions in their organization, and thus connected to the everyday operations. Two of those analysts are dedicated to print-analytics while the rest focus solely on the digital side of their business. Furthermore, they have real-time analysts in the newsroom who are assisting the editors to make better decisions in real-time. They are able to spot things the editor does not have time to look at and thus complement the process. The stated goal of the organization is to be better informed by data in their decision-making processes.

In their work with analysis of data, they gather both structured and unstructured data and conduct descriptive, predictive, and prescriptive analyses, and are trying to make it as automated as possible. They want to learn from previous experiences, determine what readers are currently interested in, and be able to take action if they for instance notice that an article

has a lot of readers leaving the article early. In their data gathering, they can make an analysis of reader patterns, since technology today enable them to monitor time spent, depth of scroll, clicks, and other interactions on their articles in real-time.

"We use to say that we generally analyse everything. We know what people are searching for online in different forums and are then able to write articles to cover those areas. We want everybody to find what they are looking for in our newspaper. What is generating discussions and interactions? We want to know what the readers are eager to read about and then supply their demand" - ***Editor/Manager***

Through this vast amount of gathered data, they rank their articles internally, not only on clicks of individual readers but also other KPI's as for instance time spent on an article, which combined generates an article score that can be benchmarked. One thing it is used for is to decrease the risk of readers quick exits, where a possible explanation is that the readers were disappointed with the content and chose to leave. This article score has now become a basis of competition between the journalists. Previously, they competed in who would get the front pages whereas today they can easily see whose article has generated the most interest and interactions.

Analytics is basically helping the people in the organization to find out how they should publish the right information to reach the maximum number of people. They also make in-depth analyses of important aspects of their business, such as the phenomena of push-articles where a notification is sent to users who have their application on their mobile device. A lot of insights may be gained from the real-time flow of data but some things require more detail. When they conduct an extensive push analysis, they go back years to see if they can detect any patterns to find a suitable level of push-notifications to find out what works and thus increase their performance.

In the future, they aim to incorporate personalization to some extent without sacrificing depth and creating filter bubbles. There is a huge difference in the stereotypical readers. Some might come to a specific article through Google or Facebook and some through their website directly. Being able to differentiate these readers and customize their experience might be the next step in the evolution. However, there is a lot of debates surrounding the topic.

There is a big ongoing discussion in the newspaper industry overall about personalization. We do not want to contribute in creating filter bubbles. Only because you have a certain political opinion you should not only be fed with articles that correlate with your opinions. It is a balance and we should

rather lift up things that contradict your opinions to get you a more nuanced view and through that make your own decisions. We are a news publisher, and we should report all news, regardless of people's interests." - ***Editor/Manager***

4.1.2 Dissemination

In order to achieve the goal of relying on data in their decision-making, a prerequisite is to spread the knowledge and insights gathered from their analyses within the organizations. At their disposal, they have an internal system both in a web and mobile application format that supplies real-time data. They also have weekly and daily meetings highlighting important insights and how they can improve. In their internal communication system, they have discussions around the clock regarding certain topics about data. Furthermore, the strategy of disseminating information to employees became apparent when we entered their offices and observed and learned that they even have more dashboards presenting real-time information than employees.

"We are trying to be very open with our data, there is nothing that is a secret. It is open for everybody to see, either on dashboards or their own desktops, which even can be used to improve their decisions. We are actively working to spread data to every position regardless of the role as we believe that if you show things openly people will be more dedicated. Journalists want to see how many readers they have and how they are interacting with their articles and are inspired to take those insights with them to their next articles." - ***Head of analytics***

Their goal is to disseminate more insights quicker and are currently working on automating as much work as possible. They collect data from a vast variety of sources and combining their systems into a single one is somewhat of a struggle. Another problem they have encountered is the possibility of employees being overwhelmed by data. As their internal data sharing application is accessible for everyone, they are now trying to customize it. Since everybody in the organization have limited amount of time they want employees to be able to simply have a quick look at a screen and get the answer they look for. Hence they argue that the efficiency of data sharing is a key to success.

As everybody has the information, they have developed a tool where journalists focus on their own statistics, where they can see detailed information about their articles published in the last ten days and easily spot what was successful or what went wrong. This allows them to be able to make a quick analysis if there was something wrong with the picture attached to the article or something else. Everybody has access to some form of master-data but it is also

targeted. As an editor you have more access to a certain kind of data and journalists has something else. Furthermore, each department is disseminated the data that is most relevant for their work.

4.1.3 Decision-making

The data they collect and disseminate within the organization is changing the way they make decisions. One example they highlighted is the ability to anticipate trends on online search engines. Being able to forecast readers interest assist them in the objective to write as relevant news as possible and thus be more efficient. Another example is the way analysts work closely with journalists in order to write more conclusive articles. An analyst can make a detailed analysis of what people thought was most interesting last time a major mobile phone manufacturer released a new model. With data gathered from various sources, they are able to predict what readers want to find out in that article and thus be more relevant for their readers. A few years ago, a lot of decisions in their organizations were based on intuition and gut-feeling. That has not disappeared completely, however, today they use data to maximise the reach and relevance of their articles and it is part of daily decision-making in the newsroom.

"We use a lot of insights in the way we are planning our work. If for instance we can see from data that Gunde Svan is a really hot topic for our readers, we make sure to plan more extensive interviews with him which includes TV and other features that demands more effort from the journalists. We plan to do this since we know for a certainty that it will attract a lot of interest and interaction. We simply know what our readers want and are thus able to give them more of that." ***- Journalist***

With the gathered data, they are also able to detect exposure patterns and thus be able to publish articles at the right time to generate the maximum exposure. This was previously impossible since they could only guess, but today through the ability to analyse the traffic on their site, they can choose to publish articles on their website when it is of highest interest. They are also able to produce follow up articles based on previously highly exposed articles, and thus continue to generate interest and linking that to the main article if some readers had missed it. As such they argue that:

"Data can help you to see things that were not seen before and through that being able to make better decisions. In the end, we will all become more driven by data, it is inevitable." ***- Editor/Manager***

4.1.4 Outcomes

Big data analytics have changed the routines, decisions, roles and other aspects at the nationwide newspaper. They have become more structured in their way of work. They routinely conduct follow-ups and evaluations that contributes to better informed strategic decisions with more employees involved. As such, they have become more cross-functional where meetings between the newsroom, advertising, and analytics are more common than previously and they are trying to involve the right people in the right decisions. Another apparent change is that the roles in the organization are changing. Their analysts have multiplied, and some journalists today are even educating themselves to become analysts as well.

"The roles have changed for basically everything. The editor can see in real-time the performance of each article and base decisions on that. Journalists have to take a larger amount of responsibility and improve their article if they see that some readers are leaving their articles quickly. This has changed the routines of how we work." ***- Editor/Manager***

The editors in the organization are using data to guide their decisions to a much higher extent than previously. The real-time tracking of performance influences the transparency of their decisions and the predictive analytics influences the decisions of what stories to focus on. Furthermore, the journalists today are more involved. Previously it was only the editors who had access to data and today journalists are able to track the performance of their individual articles which is very much appreciated. Everybody is accountable for their own material. On the highly visible dashboards, it is clearly stated which articles attract the highest interaction through their sophisticated article score rating system. This aims to increase the effort made by the journalists to produce as good material as possible.

"The role of the journalist has become more floating and is closer to the role of the editor. Since everybody has access to all information it is much easier now for a journalist to take own initiatives and decisions about their work and what to write about. They also have a higher responsibility as to make use of the knowledge we can get from reader behaviour." ***- Journalist***

4.2 Nationwide targeted newspaper

The organization is one of Sweden's biggest and most popular targeted newspapers. The organization has, successfully according to them, implemented a paid subscription based

business model for their online news. The new model was introduced less than a year ago and was implemented due to higher competition for advertising money. The reason for this was that they drew the conclusion that in the first few years the revenue generated from advertising steadily increased but has in time peaked. They argue that there is simply no way of running newspaper on simply digital advertising revenues. While running this business model, the organization faces the challenge of maintaining high traffic to the site that generates advertising income. They are balancing between being a free site and a pay site at the same time. As a philosophy, they are sticking to their core news content, instead of trying to expand to new sorts of content, as their data indicates that their core content is what generates the most interest and converts readers to subscriptions. In order to successfully make use of their business model, they use of big data analytics by disseminating the insights through their internal communication system and dashboards that presents actionable information to all employees.

4.2.1 Big data analytics

During the last year, the organization has had a bigger focus on data than previously. They have employed several data analysts that are working with the newsroom. The organization gathers both structured and unstructured data and is conducting analytics of their reader's behaviour such as what they read, how long they stay, when they read, quick exits, shares, conversion rates etc. The type of analytics is descriptive, predictive, prescriptive, and moving towards automatization. They have algorithms that rule for instance the suggestions for next readings on the site. Furthermore, they are also moving towards machine learning on the first page where the same type of readers get exposed to 3-5 different headings on an article. This allows the editors to see in real-time what works best and supports them in their decision-making

In addition to this, analytics is helping employees to keep track of their performance and is also a part of their planning work as it provides insights on what to write about. The analytical tool the organization uses shows all KPI's relevant for the article and comes with suggestions on actions given the performance. A widely shared article can, for instance, get the recommendation of locking it to convert readers who read for free to pay for a subscription. The organization is also moving towards the ability to personalize the site.

"The readers will be able to personalize some parts of the site, but in a limited way. If you are interested in banking and finance the possibility of having that news at a certain place, or your active

stock portfolios visible, will exist. You will also be able to determine how often you want newsletters about certain topics etc. However, it is active personalization and we will not make those decisions for you." - ***Head of analytics***

4.2.2 Dissemination

Since less than a year ago the newspaper uses smart dashboards in the newsroom that exhorts the editors to take certain actions. The data on the screens is updated every minute in real-time and contain different KPI's and suggested actions in order to support decisions. The data is also available through the organization's tools and everybody has access to it. Most of the information is visible on dashboards but the employees can also access everything on their computers, hence making all information transparent. What is made visible on the screens are decided by what is most relevant to the employees. The organization is trying to avoid information overload by selecting data that is relevant and actionable. They argue that if you are not able to act on the data you send mixed signals.

"We as journalists constantly get exposed to relevant information on our dashboards. However, we do not stare at it all the time. It is up to editors to more thoroughly interpret the data over time. But the real-time information definitely influences our daily work." - ***Journalist***

The information on dashboards also works as reminders to make sure all articles are optimized. The reminders include if the article has been search engine-optimized, if it includes background information such as company name and CEO, and if it has been published on social media etc. The aim is to eliminate the human factor of forgetting that all different actions have been taken to optimize the article.

4.2.3 Decision-making

"The gut-feeling is completely useless nowadays. It used to rule in the industry. Sure, you can make use of it sometimes but as a foundation for decisions, it is worth nothing now." - ***Head of analytics***

The disseminated analytics is now what rules decision-making in the organization, especially among editors that have the mandate to make the more executive decisions. The data serves as a foundation to support decisions. Except from following up on KPI's of published articles, it is used to draw conclusions from behaviour and purchasing flows and adapt accordingly. A recent example was when news about a tax rule received unsuspected high attention.

"About a week ago a suggestion for a new tax rule came. It did not feel as the most exciting news story but we saw that it led to a lot of subscription purchases. We realised that the rule would affect a lot of small business' and it was really important for them to know more about it. Then we decided to write much more about it since it was really relevant for our audience." - ***Head of analytics***

Data helps the organization in this kind of way to be relevant for their readers. Furthermore, insights of when purchases are made have been particularly useful. Data has indicated that, surprisingly for them, a lot of subscriptions are purchased on holidays, which is a time they previously thought the interest was very low. The following action was to put more effort into being even more attractive during the holidays. The organization points out that the shift to become more driven by data was natural to them. They are used to working with KPI's and reader behaviour. It is more the case of that it has become far more complex recently. The journalists at the paper also have a good knowledge of business and analytics so it is natural for them to analyse graphs etc. However, most of the decision-making that is affected by data is at the editorial level. Top management emphasise that the journalists should not focus too much on analysing data. They argue that the journalists should be out chasing news and writing based on their knowledge instead of being too ruled by page views and purchases.

4.2.4 Outcomes

"In a digitalized world, data ultimately provides us with a better foundation for decisions in real-time. It improves our accuracy in decisions" - ***Head of analytics***

Given the relatively short period that the organization has, to a much bigger extent than previously, used data in their decision-making, they perceive that they have adapted fast and see positive outcomes from it. Decisions are often made faster in the organization and for instance, web editors can make better decisions by themselves as they have data supporting them. The transparency that data brings to the organization has been particularly appreciated in the organization.

"The transparency is highly appreciated. Perhaps people do not stare at the data all the time but it is always accessible. It becomes very clear when we have targets and you can see how close we are to reaching them. It is very appreciated which is positive." - ***Editor/Manager***

As to roles, particularly the editorial work is changing. The organization has for instance a development editorial that works between analysis and the newsroom. This position can be seen as a hybrid between editor and analyst and is responsible for communicating between

analysts and journalists. Other roles are also starting to include analysis as a part of the job description, which previously was not included. However, the journalists are still lacking behind a bit with the data-driven decision-making in their work. Right now, the organization focus on starting to use data, understand it, understand how to use it for the site etc. and the next step will be for the journalist to improve when it comes to handling data and drawing conclusions from it by themselves.

According to the journalists the work at the paper has always been more driven by reporters than at other papers. This has led to that, with the emergence of big data, the editors have a higher opportunity to influence the journalists work, which to some extent is perceived as something positive as it becomes easier to know what to focus on.

"The data allows the organization to interpret which topics that generates high interest and based on that reporters can be moved from the daily rotation to focusing on these areas particularly. I see the role of the editor becoming more influential in the future as they have a better overview of the data and that is according to me a positive development as it is good sometimes to be steered in the right direction. Particularly since the organization is so much driven by the decisions of reporters." - ***Journalist***

4.3 Local newspaper

This organization is one of the biggest local newspapers in Sweden and is just as the entire industry trying to adapt to the changes that digitalization has brought. The newspaper was quite late to adapt to readers' consumption of news online and a shift occurred about three years ago as the organization explicitly made an effort to meet the demand of their readers. Before that, the print version of the paper was highly prioritised and the online news was seen as less important and mainly had the purpose of converting readers to the print paper. More recently, the organization is adapting to the loss of income the industry suffers from by, just like other newspapers, charging for their online content. They argue that the key to future success is to find a good way to charge for what they do and that it requires some sort of change in consumer behaviour that the industry has to force.

Since one year ago, the organization has started to charge for their online content with two different models. One is a frequency model that allows the reader to consume a certain number of articles before having to sign up as a user for free. The other is a paywall for certain content that has been locked as "plus articles" where the users have to sign up for a

paid subscription to take part of the content. As it is today, the organization is not locking so much content, as they prioritise getting traffic to the site and is well aware of its responsibility as a local paper to provide its readers with what is important for them for free. This philosophy applies to both what content is locked and what stories are covered. Even though a shift to prioritise what the readers seem to like to read about is occurring, the tradition of the paper is valued high. It is important for the organization to have the support from their readers when converting to a pay model.

"We must emphasise our role in the society and communicate why it is important and why the readers need us as a news organization. It has been obvious for many years that we are important for democracy but with alternative media, there is more mistrust against journalism. We want to be even better at communicating what we stand for, why it is important, and why it is worth paying for" - ***Head of analytics***

4.3.1 Big data analytics

Just as with the adapting to digitalization, the organization is a late adapter when it comes to gathering and analysing data, but is in a phase where a lot of things are happening. The organization is part of a bigger media group that owns several newspapers, where more advanced analytics on a group level is conducted by that organization. However, they are not collaborating closely and the daily use of and analysis of data is conducted by the local newspaper itself. The type of data that is used can rather be categorised as statistics than big data. The organization gathers specific data about their readers, but it is not really used as it is today. What is used is statistics such as how many readers articles have, how long readers stay at the article, what they read afterwards, when they read the articles etc. The type of analytics that is conducted is almost exclusively descriptive and it is up to the people in the organization themselves to be predictive and prescriptive. The organization is trying to become better at analysing the data at a deeper level as they are starting to realise what opportunities it brings.

"I would like to know what makes readers take certain paths and follow certain stories. It would be interesting with more qualitative data, but I know it is hard. As it is today we have to guess why people stay at articles etc. and more accurate analysis would be desirable" - ***Editor/Manager***

The organization is also thinking about the possibility of personalized news feeds but is not quite there yet. More effort in analysing long-term consumer behaviour is expressed as

desirable by all respondents. They want the ability to analyse larger data-sets more accurately but lack knowledge of how to achieve it.

"There is a lack of education and knowledge within data among the journalists. There is much to do with it if you only know how. Except for easy and efficient tools that allow everybody to take part of data in the organization, time, resources, and knowledge for more extensive analytical work is clearly needed." - ***Head of analytics***

4.3.2 Dissemination

The dissemination of analytics within the organization is done by an analytical tool, where those who want to access it is given access. Until recently, mainly managers were using the tool but it is starting to spread to everybody in the organization. It is indisputable for editors to use it daily and keep track of their department's performance, but not all reporters use it and an effort is being made this spring to educate everybody in how to use data in their work. As it is now, some reporters lack knowledge of how to use the tool and incorporate data into their work. Furthermore, weekly and daily meetings are held where the statistics of the previous week/day are discussed. The organization is moving towards becoming more real-time oriented and targeted in the dissemination of analytics and is about to implement dashboards at the office. However, as of today, no active dissemination is done and it is up to the individual to use the analytical tool to find what is relevant for them.

Nevertheless, the interest among the employees to be able to use data in their work is positive. Both the person responsible for the analytics work and editors perceives that reporters want to become better at making use of data and state that many have already incorporated it into their work. Some reporters are worried that use of big data analytics will lead to "click-chasing" but overall the interception is well received. The reporters interviewed were also positive to using data as one stated:

"I constantly use our analytical tool, even when I am not working. Usually, I have what articles that are performing best the last 15 minutes on the sports site on my screen." - ***Journalist***

4.3.3 Decision-making

The analytics is mainly influencing decision-making when it comes to prioritising among published news and to some extent as to what to write about. When optimizing the website,

analytics can be said to rule the decision-making to a higher degree than intuition and expertise. What the data says attract reader's guides what articles makes it to the top of the website. However, as to what articles are locked as plus articles are determined solely by the intuition of editors.

"Gut-feeling based on previous experience is where we are today. If we could have an algorithm to help us make more well-founded decisions in the future, it would be great. However, I do not see it being around the corner" - ***Editor/Manager***

When it comes to the editors and reporters work with what stories to cover it is still almost exclusively determined by intuition. Conclusions from data of what seems to be of interest for the readers is influencing the work but not guiding it. No efforts are based solely on digital numbers, however, if a topic is proven to be very interesting for the readers, they may continue on that path for more stories. Furthermore, data is often used when following up and evaluating work, especially if an article did not perform as expected. Then looking at KPI's can be helpful when trying to improve. Using KPI's and measurable goals are an outcome of data and it seems to affect decision-making. For instance, one journalist argued that if statistical targets are met, they can save material that they have already written in order to keep an even performance level.

Furthermore, the interviewed reporters did not perceive that the editors are steering their work in certain directions based on data or number of clicks. Data is rather used in their decision-making to become more efficient. A shift has occurred since they have been given access to data as they become better at prioritising in their work.

"I have a quite good perception of what will work statistically and not. Hence, particularly when I work with articles that I believe will have a harder time getting attention, I try to tweak it in order to become of more interest. This is a relatively new thing, as before when I did not have access to data, I had to guess what would work or not since nothing was measured. This also results in that if I know something is very unlikely to work, I either spend little time on it or decide it is not worth doing." - ***Journalist***

4.3.4 Outcomes

The outcomes of the increased use of data as support for decisions is first of all the actual increase of data as a part of daily work. From analysing data from the past 24h each day a year ago they are now down to 15-minute intervals. The organization is getting better each

day at detecting patterns and preferences of their readers and it is influencing the way everybody in the newsroom work. Overall it means that the decisions are becoming more well-founded and an outcome of that is that the organization is prioritising what to do and what not to do to a higher extent in order to become more efficient. Even though the gut-feeling is still highly present in the decision-making it has been expressed by the respondents that data helps improve their intuition.

As to routines, a culture where everything is followed up has now been established. If an article does not get the response it was thought to get, it is analysed why that is the case and an effort to optimise it by changing headings and pictures etc. is made instead of just leaving it unsuccessful. More structured forms of discussions about data have also taken form where they play "newsroom baseball" and try to guess what will become successful and not and then evaluate. Another routine that has taken form due to data is what to do if an article becomes widely shared in social media.

"If an article becomes a "click rocket" we have a checklist for what to do in order to ride the wave, which we did not have before. Some of the routines we have implemented lately are clearly data based." - ***Head of analytics***

As to roles, a lot of new roles are taking form as well as old ones changing. The role of development editor, which is a hybrid between analyst and editor was implemented only a year ago. The tasks of the development editor include analysis of reader statistics and even though the work has been done before as well, it has not been an official task. Also, the role of the classic editor is to a higher extent influenced by data in the decision-making, as the performance of reporters and articles becomes much more transparent. Furthermore, it is not only the manager positions that are changing, the work of the reporters is also impacted.

"Now you are expected to photograph, follow up on statistics, write the article, make TV (visual content), and come up with the ideas by yourself. You are driving yourself forward in a completely new way. The biggest change is absolutely that I have become much more of a multi-journalist since I started at the newspaper." - ***Journalist***

The respondent continued to explain that the work has a much higher tempo now compared to before as you are expected to do much more. The insights from data are enabling this as you can more easily prioritise among tasks. If you know something will be of low interest, you do

not spend an hour doing interviews etc., when you can make a shorter piece based only on available facts just as well.

4.4 Summary of empirical findings

	Nationwide	Nationwide Targeted	Local
Big Data Analytics			
Descriptive	✅	✅	✅
Predictive	✅	✅	❌
Prescriptive	✅	✅	❌
Automated	🟡	🟡	❌
Personalized	🟡	🟡	❌
Dissemination			
Accessibility	✅	✅	✅
Dashboards	✅	✅	❌
Active	✅	✅	❌
Targeted	✅	❌	❌
Decision-making			
Optimizing site and articles	✅	✅	🟡
Data influencing the editor	✅	✅	🟡
Data influencing the journalist	✅	❌	🟡
Explicit strategy for data-driven decision-making	✅	✅	🟡
Outcomes			
New roles	✅	✅	✅
New routines and processes	✅	✅	✅
Efficiency	✅	✅	✅
Accuracy	✅	✅	✅
Transparency	✅	✅	🟡
Speed	🟡	🟡	🟡

Green=Fulfilled

Yellow=Partly fulfilled

Red = Not fulfilled

Table 4. Summary of empirical findings.

5. Analysis of our theoretical and empirical findings

5.1 Industry

Whether you are a national or local newspaper in Sweden you all face the same problems. The industry is changing due to increasing competition for advertising money (Nygren & Althén, 2014), where new competitors take a larger piece of the pie than anticipated. Combine that with digitalization, where digital news does not produce the same income from subscriptions and advertisement as print, and the challenges become even harder. The three newspapers in our study have adopted similar but yet different tactics to face these challenges. As the readers of their print editions continue to decline with about 10 % a year, they have a huge task in replacing that income. One way of achieving this is by implementing a paywall where readers are forced to pay for digital articles. A challenge with this is to change the reluctance of paying for digital content. Changing behaviour is not easy and in order to do this, newspapers have adopted advanced analytics to become more relevant for their readers and more efficient in reaching their goals (Bédier et. al., 2014; Evens & Van Damme, 2016). In the modern era, mistrust against traditional media is higher than ever and newspapers are struggling to maintain the status they once had. They believe that there are great challenges ahead but are confident that combining the huge amount of knowledge inside the organization with data will help them become victorious. They also acknowledge and want to remind people that as newspapers they have a responsibility to report everything relevant to the general public and are thus also aware of the great possibilities but also dangers of big data when it comes to personalization.

According to theoretical findings, newspaper organizations have the opportunity the gain competitive advantages from deriving insights from big data analytics and personalizing newsfeeds in order to be more relevant for their readers (Hammond, 2015; Pence, 2014). In the Swedish newspaper industry, according to our findings, there is a reluctance in personalizing the feeds, even though it could clearly lead to higher income. The local newspaper does simply not have the technology to implement personalized news feeds, but both the nationwide newspaper and the nationwide targeted newspaper are dealing with this dilemma of personalization. The targeted paper, that already has a more specific audience, is more positive to allowing the readers to actively customize their feeds. The nationwide paper is however very concerned with creating filter bubbles and stress their responsibility in

reporting all news and making the same content visible for everybody. They see a possibility of being able to follow your specific sports teams or journalists, but as it is today they are not going to customize the feeds according to reader preferences.

What is more in accordance with the theoretical findings is the ability to better know what the readers want and optimize articles and topics accordingly. In the era of big data, newspapers do not have to guess what to write, for whom, and when and where to publish it (Hammond, 2015). This was the case traditionally, especially with the print editions that allowed little measurements that often were inaccurate (Harrower, 2010). The available data and statistics in all the organizations are used in order to be relevant for the readers and functions as support for decisions. It is also connected to driving traffic and converting readers to subscriptions (in the organizations with such a business model) in order to increase income and stay competitive. This is in line with what the theoretical findings claimed to be the case for the industry (Bédier et. al., 2014; Hammond, 2015; Pence, 2014; Nygren & Althén, 2014).

5.2 Big data analytics

Integrating big data processes in an organization is a process that takes time (Turban, 2015). All newspapers acknowledged that big data analytics offer an unparalleled opportunity to analyse their readers' behaviour (Bédier et. al., 2014), and detect patterns (Waller & Fawcett, 2013) that will allow them to know what the readers exactly want. However, it became apparent when we visited the three different newspapers for our study that they have some significant differences between them in their data processes. Being able to make sense of and analyse unstructured information requires advanced technology (Hammond, 2015; Pence, 2014) that takes time and resources to incorporate, and thus the operation must have the executive management's support (Phillips-Wren & Hoskinsson, 2015). All three newspapers basically measure the same things through direct traffic on their site but the difference is how they analyse it. In the local newspaper, their system only provides the data and it is open for own interpretations. Meanwhile, in both nationwide newspapers, the system interprets the data and provide both predictive and prescriptive analyses. Thus, making it easier and faster for journalists and editors to make decisions based on real-time information. In the nationwide newspaper, they have even created a scoring system that keeps track of performance and comes with suggested actions. For instance, when an article has a high number of readers leaving quickly, the system suggests that they edit that article in certain

ways. Both nationwide newspapers are also testing automated systems that for instance test different headings on articles to individual readers in order to decide which heading is best suitable for maximum exposure. As such, they do not have to guess the performance of a specific article, as in the era of big data they know (Hammond, 2015). Hence, all three newspapers have the necessary tools to become data-driven but are in different phases on their journey and have adopted different strategies to tackle their challenges, but all recognise the importance of big data analytics and the value it offers.

5.3 Dissemination

All three organizations collect data from their readers, but there is a difference in what kind of analyses they make and how they then disseminate that information internally for their employees. A probable cause of the differences between the organizations is resources and how long ago they started to implement big data analytics. The nationwide newspaper has come furthest in the process of implementing big data analytics in their decision-making. An evidence of this is that their analytics department has moved from being furthest down in the office to the front row where the head of analytics' office is next to the editor in chief's. They have internal systems for both web and mobile applications to disseminate the data they collect and the insights derived from that data to their employees. They also have a higher number of dashboards presenting real-time information about their site and individual articles. Hence, they are recognising the importance of having a strategy for making data accessible (Anderson, 2015) and disseminating it to people in the organization (Kingston, 2012).

The nationwide targeted newspaper waited a while longer and it was not until one year ago they fully invested themselves in analytics that today is accessible to everybody in the organization. The nationwide newspaper already has automated systems that filter the information they send out to their employees to reduce the chance of information overload. This is line with what Sharda et. al. (2014) claims to be active communication to a targeted audience. The nationwide targeted newspaper is only in the beginning of this process. They have dashboards clearly visible in their offices providing relevant information to their employees but they are not yet targeted in the dissemination as all employees are disseminated the same information.

In the local newspaper, they are thinking about implementing dashboards and everybody has access to the system if they actively ask and it is still mainly used by editors and managers. They are still in the process of educating their employees in how to use the system and spread it within the organization. One reason for this may be that the local newspaper chose to abandon their strategy to use their digital site as a mean to convert readers to print only a few years and has since then built up their digital platform and is just now starting to analyse the information they gather.

5.4 Decision-making

The newspaper industry has for a long time been characterised by intuition and gut-feeling among both editors and journalists in their decision-making (Nikunen, 2013). Big data analytics is enabling data to be put in the heart of the decision-making processes in the industry and hence shift from System 1 to System 2 thinking (Stanovich & West, 2000). The empirical findings indicate that even though a lot of decision-making is moving to being data-driven, the intuition still has an important role to play and many respondents do not see intuition and data as incompatible opposites.

A common denominator in all studied organizations is that they use data to optimize their articles and websites. Data is enabling them to predict reader patterns and consumer behaviour (Bédier et. al., 2014), which improves decision-making, particularly for editors. A respondent from the nationwide targeted newspaper even expressed that the gut-feeling is completely useless today. When it comes to deciding what stories to cover, the nationwide newspaper has incorporated data in their decision-making to the highest extent. Their analytics is best at predicting what the readers want to read about in the future as they analyse for instance what people search for online and write stories accordingly. The other organizations focus more on analysing already published articles. Hence, the nationwide paper is more clearly steering what their journalists should write about than the other organizations. In the local organization, the decision-making about what stories to cover is said to be solely based on intuition, even though data helps improve the intuition. Overall, data is causing the decision-making of editors to become much more transparent. Since the performance of articles is visible for everybody it is hard for an editor to be a HiPPO (Brynjolfsson and McAfee, 2012) that overrules data based on intuition.

As to the work of the journalists, they are given the freedom to write about what they want, but data is now to a higher extent assisting them in order to improve their work. They all evaluate their performance more and data has been said to help them become more efficient in what to focus on. Data is also resulting in that they benchmark their work against both KPI's and other journalists' performance. This causes them to take actions to improve their statistics and their articles. This is clearly an outcome of data playing a bigger part in the organizations, as traditionally in the print editions nearly nothing could be measured (Harrower, 2010) and the performance was not as transparent as it is today.

This has led to the development that, overall, all organizations have during the past years incorporated data into their daily work and in their decision-making. The effect that big data analytics has on decision-making have been argued by all the respondents is that it helps them make better decisions. This is in line with the reasoning of McAfee & Brynjolfsson (2012), Schrage (2016), Anderson (2015) etc. that all argue that being data-driven in decision-making leads to better decisions. More specifically, the respondents pointed at the effect that it has led to the decision-making in the organizations becoming more efficient, transparent and accurate. The theoretical findings gave the anticipation of faster decision-making being maybe the most apparent effect but the respondents only agreed to a certain extent and pointed more at the effects above.

5.5 Outcomes

Traditionally, newsrooms have consisted of people with distinguished roles and specialised tasks (Amnestål et. al., 2002). An apparent outcome of the increased presence and importance of data within all studied organizations is that new roles are forming and old ones are changing. On the first level of our categorization of interviewed employees (head of analytics), it is apparent that a lot more resources are spent on expanding the analytics teams. The nationwide newspaper is the one that has come the furthest and also expands the fastest. The targeted nationwide paper is a bit behind, but still employs pure analysts, and the local newspaper does not yet have people working only with analytics, but is moving towards that and have employees with analytics as a formal task.

The role of the editor seems to change in all organizations. They all have a formal position within the organization called development editor, which is a hybrid between analyst and

editor working closely with both the analyst team and the newsroom. This is clearly an outcome of data playing a bigger part in the organizations and people with knowledge of both editorial work and analytics is needed. The nationwide organization has recently employed journalists from the organization as analysts in order to fill this knowledge gap. Furthermore, the classic editors also have to incorporate data into their work and decision-making, hence also becoming closer to a hybrid editor than what they used to be.

The role of the journalist is also changing as a consequence of that fewer people in the organization are expected to do more. If this is an outcome of organizations having to rationalise or becoming more driven by data is hard to distinguish, but both reasons seem to be contributing to the development. A respondent expressed that he is becoming much more like a multi-journalist as he is expected to photograph, follow up on statistics, write articles, make TV (visual content), and come up with ideas by himself. Journalists are today expected to be more involved in the entire process of a news article. This is apparent in all organizations studied, with an exception of the nationwide targeted newspaper that stressed that it was important for them that the journalists focused on their core tasks and rather allowed keeping track of data to editors.

An interesting finding is that in all organizations, data seems to equal the roles and the power in the organizations. In the nationwide paper and the local paper, the results indicate that, traditionally, editors have had a very powerful role and that data means more transparency, which leads to that the power gap to the journalists narrows. In the nationwide targeted paper, it is the opposite since the findings indicate that journalists have traditionally had very high influence of what to write about, but the emergence of data means that the editors are given more power since they have more insights from the data.

6. Conclusions

The purpose of the thesis was to investigate how big data analytics affect decision-making with the newspaper industry as an empirical example. The results indicate that the increasing use of big data analytics seem to be a way for organizations to improve their decision-making. More specifically, within the studied organizations, big data analytics has led to that there is a higher degree of transparency and accuracy in decisions, new roles have emerged, routines and processes are changing, and overall the organizations are becoming more efficient.

Within the context of the newspaper industry, that is going through severe challenges, both our theoretical and empirical findings suggest that big data analytics is a way of adapting and being more efficient with both time and other resources. The industry overall has pushed towards adapting to changes fairly quickly, but implementing new processes and necessary tools takes time. Even though all three studied organizations are adapting, there are differences in how far they have come with their work with analytics and how they disseminate it. The nationwide newspaper has come the furthest, followed by the nationwide targeted newspaper, and lastly the local newspaper. The main difference is the level of sophistication of analytics and efficiency of the dissemination. This difference has to do with the strategy, size, and resources of the organizations. The earlier the organizations started to use big data analytics and the amount of resources they have spent on it can explain why they are at different stages both regarding what data they analyze and disseminate and how much it affects their decision-making.

The effect on decision-making is that the better the analytics and the dissemination is, the more does data influence decision-making of editors and journalists causing them to become more data-driven. Big data analytics that has been incorporated in every-day processes is making decision-making easier for everybody involved. This has implications for work procedures for employees on all the studied organizational levels: head of analytics, editors/managers, and journalists. The decision-making and routines for how a news story goes from an idea to a published article have fundamentally changed. Today, journalists and editors receive information from disseminated data that firstly guides them regarding what the readers wish to read about. Secondly, the data indicates what should be included in the article and how it should be optimized to gain maximum exposure. Finally, the performance of the article is evaluated in real-time, which provides both editors and journalists with the ability to edit it, if needed, in order to increase the performance.

Furthermore, something particularly interesting from the empirical findings is the new roles of hybrid editors and multi-journalists that seem to be a direct cause of organizations becoming more data-driven in their decision-making. This can be a positive effect that means that organizations are becoming more efficient, but a possible downside is a potential de-professionalization of roles. The editors are moving from their core tasks of deciding what news to cover based on intuition, to relying on actual performance data in their decisions. This means that it is rather the data that rules the organizations than the expertise of editors. It is also apparent that many journalists are given more tasks than solely writing. As they are expected to keep track of data and take higher responsibility of the entire lifecycle of an article, their role is also changing. If this is a de-professionalization is debatable since it can also be seen as the role is only starting to include more responsibility. It is not as clear as the case with the editors, that the power of their expertise is decreasing. This means that, due to the potential de-professionalization, it is possible that implementing big data analytics will encounter resistance within organizations since it could contribute to a power shift from expertise based managers to data informed managers. Hence, it is vital for managers of today to be aware of this possible change in order to succeed in the organizations of tomorrow.

In conclusion, big data analytics enable organizations to gain increased knowledge about their own internal operations and external relations, with the prerequisite that the organizations collect and analyze data gained from their everyday operations. This increased knowledge can then be used to transform the decision-making processes within the organizations and make decisions based on data rather than intuition and gut-feeling of managers. However, as found in both our empirical and theoretical research, in order for this transformation to reach its full potential, processes, routines, and roles must change and thus the biggest obstacle for implementing successful decision-making based on big data analytics is rather an organizational challenge rather than a technical one.

6.1 Contributions

The findings of the thesis are contributing to the research area of big data analytics and decision-making. Previous research had not focused particularly on the dissemination of big data analytics and what effect it has on decision-making. More specifically, similar kind of research had not been applied to the newspaper industry. Hence, the thesis makes theoretical contributions to researchers within this area by using the newspaper industry as an empirical example, which in turn provides practitioners with insights on how to adapt to changes within

the industry. The findings indicate that if big data analytics is made accessible to employees and disseminated in real-time to targeted audiences, it can lead to decision-making shifting from being based on intuition to being data-driven. The outcomes of this shift are that decisions in organizations becomes more accurate, transparent, efficient, and to some extent faster. Furthermore, the findings indicate that applying big data analytics and disseminating it within an organization has impacts on roles. Within the newspaper industry, the editors are becoming more like hybrids between analysts and editors, which means that their decisions are based more on data than intuition. The journalists are also becoming more like multi-journalists with higher responsibility for their work. These findings can be of interest for both organizations within the newspaper industry as well as for other organizations looking to create competitive advantages by using big data analytics as a means for improving their decision-making.

6.2 Limitations

The findings indicate that big data analytics is impacting decision-making within the empirical context of this study. As all newspapers in our study are originated from Sweden, the findings are mostly applicable to organizations in this specific setting but can be generalized to the newspaper industry in general. Furthermore, being able to determine the exact effect big data analytics has on decision-making would have required a more in-depth study over a longer period of time, including a larger sample, but it is safe to conclude that big data analytics incorporated in decision-making processes is helping newspaper organizations to make better decisions. However, the findings also indicate that newspapers can never be 100 % data-driven since only focusing on reader interests would mean sacrificing depth of their reporting, which goes against their principles of objectivity.

Furthermore, the newspaper industry is a frontrunner in implementing big data analytics. This means that big data analytics will likely affect other industries in similar ways. However, being able to determine those effects would require a study drawing comparisons between industries. If these findings are applicable to other industries is primarily depending on the features of the industry and the nature of its decision-making. For instance, the newspaper industry is characterized by fast decision-making, therefore disseminating targeted information in real-time is highly valuable for the decision-makers. In industries with more long-term decision-making, a similar approach might not be as valuable. Such differences

could have implications for both the effect big data analytics has on decision-making as well as for outcomes on routines and roles, including potential de-professionalization.

6.3 Future research

The newspaper industry is going through massive changes and will be of continuing interest in the future. A particularly interesting finding from this research is the new roles forming in the studied organizations, which would be suitable to conduct further research of. Particularly, what consequences a potential de-professionalization of the role of the editor has for the industry and the decision-making would be a suitable topic of research. Furthermore, the development of big data analytics making personalization of news possible would be interesting to follow in the future for researchers.

Similar kind of research of how dissemination of big data analytics affect decision-making could also be applied to other industries. It would be interesting to both compare our findings with industries with similar features as the newspaper industry, as well as industries with completely different ones. Hence, when conducting future research, it is important to be aware of the unique features of the industry. Moreover, the topic of a potential de-professionalization of roles as an outcome of decision-making becoming data-driven would also be suitable to conduct research of in other empirical settings than the newspaper industry. In addition to these proposed topics for future research, the field of big data analytics is still relatively new and more empirical studies from an organizational perspective is necessary.

References

Anderson, C., 2015. “Creating a data-driven organization: Practical advice from the trenches”, *O’Reilly Media Inc*, Sebastopol.

Amnestål, Per. & Tiger, K., 2002, “Så arbetar en journalist”. 2th ed., *Liber,* Stockholm.

Awad, E.M. & Ghaziri, H.M., 2003. “Knowledge Management”, *Prentice Hall*, New Jersey.

Baro, E., Degoul, S., Beuscart R. & Chazard, E., 2015. “Toward a Literature-Driven Definition of Big Data in Healthcare”, *BioMed Research International*, vol 2015.

Barton, D. & Court, D., 2012, “Making Advanced Analytics Work For You”, *Harvard Business Review*, 90, 10, pp. 78-83.

Bazerman, M.H. & Moore, D., 2013. “Judgement in Managerial decision-making”, 8th ed., *John Wiley and Sons*, New Jersey.

Bédier, V., Bright, J., Cain, M., Dutton, W., Kantchev, G., McGuire, S., Newman, N., Nielsen, R. & Ogston, A., 2014. “Measuring Online News Consumption and Supply”. *Reuters Institute for the Study of Journalism*. Downloaded 2017-03-17: https://www.ofcom.org.uk/__ data/assets/pdf_file/0024/23775 /measuring-online-news.pdf.

Bounegru, L., 2012. “Data journalism in perspective.” Downloaded 2017-03-29: http://datajournalismhandbook.org/1.0/en/introduction_4.html

Bryman A. & Bell, E., 1968 2007. “Business research methods”, 2nd ed., *Oxford University Press,* Oxford.

Blumberg, B., Cooper, D. & Schindler, P. S., 2011. “Business Research Methods”, 3th ed., *McGraw-Hill Higher Education*, New York.

Bower, J.L., Christensen, C.M., 1995. “Disruptive Technologies: Catching the wave.” *Harvard Business Review*. Downloaded 2017-04-15__ https://hbr.org/1995/01/disruptive-tech nologies-catching-the-wave

Brynjolfsson, E., Hitt, L. & Kim, H. H., 2011. “Strength in Numbers: How Does Data-Driven Decisionmaking Affect Firm Performance?”. Downloaded 2017-02-10: https://papers.ssrn.co m/sol3/papers.cfm?abstract_id=1819486

Collis, D. J., Olson, P. W. & Furey, M., 2009. “The Newspaper Industry in Crisis”. Harvard Business School. Downloaded 2017-04-03: http://www.hbs.edu/faculty/Pages/item.aspx? num=37093

Corea, F., 2016. “Big data analytics: a management perspective”, *Springer*, Berlin.

Cukier, K., & Mayer-Schoenberger, V., 2013. “The rise of big data: How it's changing the way we think about the world”. *Foreign Affairs*, vol. 92, Issue, 3, pp. 28-40.

De Mauro, A., Greco, M. & Grimaldi, M., 2016. “A formal definition of Big Data based on its essential features”. *Library Review*, vol 65. Issue 3, pp. 125-135.

El Houari, M., Rhanoui, M. & El Asri, B., 2015. From Big Data to Big Knowledge: The art of making Big Data alive. *International Conference on Cloud Technologies and Applications*.

Erickson, S., & Rothberg, H., 2014. “Big Data and Knowledge Management: Establishing a Conceptual Foundation”. *The Electronic Journal of Knowledge Management*, vol. 2, pp. 108-116.

Evens, T. & Van Damme, K. 2016. “Consumer’s Willingness to Share Personal Data: Implications for the Newspaper Business Models”, International Journal on Media Management, vol. 18, no. 1, pp. 25-41.

EY., 2014. Big data: Changing the way businesses compete and operate. Downloaded 2017-02-02: http://www.ey.com/Publication/vwLUAssets/EY_-_Big_data:_changing_the_way_businesses_operate/%24FILE/EY-Insights-on-GRC-Big-data.pdf

Fitzgerald, M., 2015. “General Mills Builds Up Big Data to Answer Big Questions”, *MIT Sloan Management Review*, vol. 56, Issue 4.

Gandomi, A. & Haider, M., 2015. “Beyond the hype: Big data concepts, methods, and analytics”, *International Journal of Information Management*, vol. 35, Issue 2, pp. 137-144.

Hammond, P., 2015. “From Computer-assisted to data-driven: Journalism and Big Data”, *Journalism*, vol. 18, Issue, 4, pp. 408-424.

Hand, D. J., 2007. ”Information generation: how data rule our world”, *Oneworld*, Oxford.

Harrower, T. 2010. “Inside Reporting: A Practical Guide of the Craft of Journalism”. 2th ed., *McGraw-Hill*, Boston.

Henke, N., Bughin, J., Chui, M., Manyika, J., Saleh, T., Wiseman, B. & Sethupathy, G., 2016. "The Age of Analytics: Competing In a Data-Driven World”. McKinsey Global Institute. Downloaded 2017-02-010: http://www.mckinsey.com/business-functions/mckinsey-analyt ics/our -insights/the-age-of-analytics-competing-in-a-data-driven-world

Holme, I. M. & Solvang, B. K., 1997. “Forskningsmetodik: om kvalitativa och kvantitativa metoder”.*Studentlitteratur,* Lund.

Holt, A., 2010. “Using the telephone for narrative interviewing: a research note”. Qualitative Research, 10(1), pp.113-121.

IBM., 2017. “Bringing Big Data to the Enterprise: What is Big Data?”. Downloaded 2017-02-13: https://www-01.ibm.co m/software/data/bigdata/what-is-big-data.html

Kasprzak, E., 2012. “Titanic: Captain Edward John Smith’s legacy”. Downloaded 2017-03-14: http://www.bbc.com/news/uk-england-17181461

Kingston, J., 2012. “Choosing a Knowledge Dissemination approach”. *Knowledge and Process management*, vol 19. Issue 3, pp. 160-170.

Kiron, D., 2017. “Lessons from Becoming a Data-Driven Organization”, *MIT Sloan Management Review*, vol. 58, Issue, 2.

Kościelniak, H. & Puto, A., 2015. “BIG DATA in decision-making Processes of Enterprises”. *Procedia Computer Science*, vol. 65, pp. 1052-1058.

Kvale, S., 1938-2008 1996, “Interviews: an introduction to qualitative research interviewing”, *SAGE*, Thousand Oaks.

Laney, D., 2001. "3d Data Management: Controlling Data Volume, Velocity and Variety," *META Group Research Note* (6).

Latour, B., 2011. “Networks, societies, spheres: Reflections of an actor-network theorist.” *International Journal of Communication*, vol 5, pp. 796–810.

LaValle, S., Lesser, E., Shockley, R., Hopkins, M. S., & Kruschwitz, N., 2011. “Big data, analytics and the path from insights to value”. *MIT Sloan Management Review*, 52, no. 2, p. 21-32.

Levy, S., 2012. “Can an algorithm write a better news story than a human reporter?” Downloaded 2017-04-24:http://www.wired.com/2012/04/can-an-algorithm-write-a - better-news-story-than-a-human-reporter/

Marr, B., 2015. “Big Data: Using SMART big data, analytics and metrics to make better decisions and improve performance.” *John Wiley and Sons*, New Jersey.

McAfee, A. & Brynjolfsson E., 2012. “Big Data the Management Revolution.” *Harvard Business Review*, vol 90. Issue 110 pp. 60-68.

Medievärlden, 2013. “Så mycket krympte redaktionerna.” Downloaded 2017-03-27: https://www.medievarlden.se/2013/02/sa-mycket-krympte-redaktionerna-i-fjol/

Melesko, S. 2013. ”Affärsmodeller och kvalitetsjournalistik – hur ska det gå ihop?”. I: Nygren, G. & Wadbring, I. “På väg mot medievärlden 2020: Journalistik, teknik, marknad.” 5th ed, pp. 119-141. *Studentlitteratur,* Lund.

Miller, R., 2015. “AP’s ‘robot journalists’ are writing their own stories now”. Downloaded 2017-04-19: http://www.theverge.com/2015/1/29/7939067/ap-journalism-automation-robots -financial-reporting

Mitzner, D., 2016. “What is a data-driven company”? *Infoworld*. Downloaded 2017-03-14: http://www.infoworld.com/article/3074322/big-data/what-is-a-data-driven-company.html

Mohanty, S., Jagadeesh, M. & Srivatsa, H., 2013. “Big data imperatives: enterprise big data warehouse, BI implementations and analytics.” *Apress*, New York.

Nikunen, K., 2014. “Losing my profession: Age, experience and expertise in the changing newsroom”, *Journalism*, vol. 15, no. 7, pp. 868-888.

Nygren G. & Althén., 2014. “Landsbygd i medieskugga”. *Södertörns högskola*, Stockholm.

Oremus, W., 2014. “The first news report on the L.A. earthquake was written by a Robot”. Downloaded 2017-04-02: http://www.slate.com/blogs/future_tense/2014/03/17/quakebot_ los_angeles_times_robot_journalist_writes_article_on_la_earthquake.html

Orvesto, 2016. “ORVESTO Konsument 2016:2”. Downloaded 2017-04-03: https://tns-sifo .se/rapporter-undersokningar/orvesto-konsument-20162

Pence, H.E., 2014. “What is Big Data and Why is it Important?”, *Journal of Educational Technology Systems,* vol. 43, pp. 159-171.

Pearson, T. & Wegener, R., 2013, “Big Data: The Organizational Challenge Bain & Company“. Downloaded: 2017-02-12: https://www.bain.com/images/bain_brief_big_ data_the_organization al_challenge. pdf

Peters, C., & Broersma, M. 2016. “Rethinking Journalism Again: Societal role and public relevance in a digital age.” *Routledge*, Abingdon.

Phillips-Wren, G. & Hoskisson, A., 2015. “An analytical journey towards big data”, *Journal of Decision Systems*, vol. 24, issue 1, pp. 87-102.

Reid, R. & Frankel, F., 2008. “Big Data: Distilling meaning from data.” *Nature*, vol. 455, Issue 7209.

Robson, C., 2002. “Real World Research: a resource for social scientists and practitioners-research.” *Blackwell*, Hoboken.

Rubin, P.J., 2013. “The Big Potential of Big Data: A field guide for CMOS”. *Forbes Insights.* Downloaded 2017-04-01: https://images.forbes.com/forbesinsights/StudyPDFs/RocketFuel_ BigData_REPORT.pdf

Salas, E., Rosen, M.A. & DiazGranados, D., 2010. “Expertise-Based Intuition and decision-making in Organizations”, *Journal of Management*, vol. 36. Issue 4, pp. 941-97

Saunders, M., Lewis, P. & Thornhill, A., 2009, “Research Methods for Business Students”, *Financial Time Prentice Hall.*

Schrage, M., 2016. “How the Big Data Explosion Has Changed decision-making”, *Harvard Business Review*.

Sekaran, U. & Bougie, R., 2010. “Research methods for business: a skill-building approach”, 5th ed. *John Wiley and Sons*, New Jersey.

Shah, S, Horne, A, & Capellá, J., 2012. ”Good Data Won't Guarantee Good Decisions”, *Harvard Business Review*, 90, 4, pp. 23-25.

Sharda, R., Delen, D. & Turban, E., 2014. “Business Intelligence: A Managerial Perspective on Analytics, third edition.” *Pearson Education Limited*, New Jersey.

Silverman, D., 1943 2006, “Interpreting qualitative data: methods for analyzing talk, text and interaction”, 3rd ed., SAGE, London.

Simon, H, 1957. "A Behavioral Model of Rational Choice", in Models of Man, Social and Rational: Mathematical Essays on Rational Human Behavior in a Social Setting. *John Wiley and Sons*, New Jersey.

Sondergaard, P, 2011. “Gartner Says Worldwide Enterprise IT Spending to Reach $2.7 Trillion in 2012”. *Gartner*. Downloaded 2017-02-22: http://www.gartner.com/newsroom/ id/1824919

Stanovich, K. E. & West, R.F., 2000. “Individual differences in reasoning: Implications for the rationality debate?” *Behavioral and Brain Sciences*, vol 23, no. 5, pp. 645-665.

Stone, M. 2014. “Big Data for Media”. *Reuters Institute for the Study of Journalism*. Downloaded 2017-04-13: https://reutersinstitute.politics.ox.ac.uk/sites/default/files/Big%20 Data%20For%20Media_0.pdf

Turban, E., Volonino, L. & Wood, G., 2015. “Information Technology for Management”. 10th ed. *John Wiley and Sons*, New Jersey.

Wahlund, R., Rademaker, C., Nilsson, P. & Svahn, M. 2013. “Mediernas roll i marknadskommunikationen.” In: Nygren/Wadbring, På väg mot medievärlden 2020 – journalistik, teknik, marknad. *Studentlitteratur*, Lund.

Waller, M. & Fawcett, S., 2013. “Data Science, Predictive Analytics, and Big Data: A Revolution That Will Transform Supply Chain Design and Management”, *Journal of Business Logistics*, vol. 34, no. 2, pp. 77-84.

Yin, R.K., 2009. “Case study research: design and methods” 4th ed., *SAGE*, London.

Appendix

Criteria	Operationalization
Volume	1. Are you handling so large volumes of data that traditional data processing is insufficient? 2. Is the volume of data you are handling constantly increasing?
Variety	3. Are you collecting data from different sources? What sources? 4. Is the collected data both structured and unstructured?
Velocity	5. Would you describe the speed of generation and the rate of analysis as high? 6. Is it higher than before you used big data?
Veracity	7. Do you have procedures for ensuring that the collected data is trustworthy? 8. Is the data deemed trustworthy among the end-users?
Analysis	9. Do you conduct descriptive, predictive and prescriptive analysis?
Accessible	10. Is the analysis accessible for everybody in the organisations?