BIG DATA FOR BUSINESS DEVELOPMENT

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BIG DATA FOR BUSINESS DEVELOPMENT

KVARKEN DESTINATIONS

Work Package 3: Digitalization | Activity: Digital Guide
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Responsible Project Partner: Hanken Svenska Handelshögskolan
Authors: Patrick Latvasalo | Peter Björk |

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Abbreviations

BA	Botnia-Atlantica Programme

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1. Introduction

Digitalisation, new technology, IoT, EoT, cheaper and bigger storage capacity and faster data processors support the use of big data for business development - and the development is fast. However, what is lagging, and holding back its full use in most companies, is big data insight and proof of analytics. This report excels our understanding of big data for business development by first defining big data. Thereafter, the potential and challenges related to big data is discussed following a stage-gate innovation model and a customer insight and marketing approach. Finally, suggestions for how to make sense of big data are presented with some illustrative cases.

2. Conceptualizing Big Data

Big data as a concept and phenomenon has rendered a vast amount of different explanations and definitions. A summary of a selection of explanations of big data presented in Table 1 bring us to the following definition,

Big Data consists of a huge data set characterized by high volume, velocity and variety, and can be used to create actionable insight for value creation, co-creation and facilitation.

Table 1 – Big Data – Definitions.

Author	Year	Definition
Bello-Orgaz, Jung & Camacho	2016	Big data refers to datasets that are terabytes to petabytes (and even exabytes) in size, and the massive sizes of these datasets extend beyond the ability of average database software tools to capture, store, manage, and analyse them effectively.
De Mauro, Greco & Grimaldi	2016	Big Data is the Information asset characterised by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods for its transformation into Value.
Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan	2015	Big data is a set of techniques and technologies that require new forms of integration to uncover large hidden values from large datasets that are diverse, complex, and of a massive scale.
Wamba, Akter, Edwards, Chopin & Gnanzou	2015	Therefore, we define ‘big data’ as a holistic approach to manage, process and analyze5 Vs (i.e., volume, variety, velocity, veracity and value) in order to create actionable insights for sustained value delivery, measuring performance and establishing competitive advantages.
Chen, Mao & Liu	2014	In general, big data shall mean the datasets that could not be perceived, acquired, managed, and processed by traditional IT and software/hardware tools within a tolerable time.
Chen & Zhang	2014	More commonly, Big Data is a collection of very huge data sets with a great diversity of types so that it becomes difficult to process by using state-of-the-art data processing approaches or traditional data processing platforms...More generally, a data set can be called Big Data if it is formidable to perform capture, curation, analysis and visualization on it at the current technologies.

Kitchin	2014	In other words, big data consists of massive, dynamic, varied, detailed, inter-related, low cost datasets that can be connected and utilised in diverse ways, thus offering the possibility of studies shifting from: data-scarce to data-rich; static snapshots to dynamic unfoldings; coarse aggregation to high resolution; relatively simple hypotheses and models to more complex, sophisticated simulations and theories.
Rao	2014	Big data refers to the growth and availability of large volumes of data, both structured and unstructured. Such an exponential volume of data could not be analysed by the traditional software used to handle databases.
Batty	2013	'... any data that cannot fit into an Excel spreadsheet ...' This implies that big data is not a new concept but exists in every era where the tools for data processing are always being stretched by increasing size…Much if not most of what we now call big data is produced automatically, routinely, and by various forms of sensors.
Kumar	2013	The term big data referred to the phenomenon of advancing trends in technology that enabled a fresh approach to assessing the world and arriving at decisions. It represented an approach wherein decision making was largely dependent upon data and analysis instead of experience and intuition. Some experts also employed the term 'big data' to describe datasets whose size was beyond the capability of normal database software device to capture, store, handle and assess.
Gartner	2012	Big data is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.
TechAmerica Foundation's Federal Big Data Commission	2012	Big data is a term that describes large volumes of high velocity, complex and variable data that require advanced techniques and technologies to enable the capture, storage, distribution, management, and analysis of the information.

As can be seen in our definition, big data is presented by the means of a set of different characteristics. Huge in the context of big data refers to data sets that are so significantly large, diverse and complex at the time that it is not possible to process the data through traditional database systems in a timely manner, thus an alternative method must be chosen for the task (Dumbill 2013, 1-2). This aspect of big data comprehends the main characteristics of the information, which are volume, variety and velocity.

Volume refers to the large quantity and size of the data, which requires adequate space for storage. Variety implies on the diverse (numbers, text, images and videos) and complex (structured and un-structured) nature of the data as it is collected from a varied set of different sources and comes in different formats. Finally, velocity is referring to the speed of the process of collection and transfer of the data, which is optimally operated in real time. (Russom 2011, 6-7, see also Wamba et al. 2015, 235-236)

3. Big Data for Business development - potential and challenges

Business development can take many forms. It can involve, for example, organisational development, process development, business network development, product development, and customer insight development. With a focus on product and service, and customer insight development, and by applying a stage – gate approach for innovations (idea generation, concept development and test, and launch and follow up) the potentials and challenges of big data for marketing are discussed.

3.1. Big data for product and service development

Many management decisions can be supported by big data and marketing analytics. In this report focus is on new service development, which for sure is a process of many integrated phases, but for simplicity and structure here presented as a process of three; Idea generation, Concept development and test, and Launch and follow-up.

Idea generation

An idea is a cognitive thought of a potential concept, action or solution to a problem that has been constructed in the mind of the idea holder by e.g. brainstorming. When this idea is adopted and commercially implemented for the purpose of practical use it becomes an innovation (Riedl, May, Finzen, Stathel, Kaufman and Krcmar 2009: 4-5). Through idea generation the idea is reconstructed into reality by constructing, refining and communicating the concept with others within the organization, to at the end become a new product, service or solution.

Potentials

New ideas in companies can result in either incremental or radical innovations (or both), and the information stored, digital in format, can be based on company internal information and/or collected externally. Consequently, for idea generation Big data brings forth the possibility to identify emerging trends and by that be a source for inspiration (De Mauro, Greco & Grimaldi 2016: 124). With an updated structure of internal communication and knowledge sharing in companies based on big data, new combinations of knowledge structures can emerge (De Mauro, Greco & Grimaldi 2016: 127). For other type of business, this kind of monitoring and intelligence can be used to identify “hot topics” (Gandomi & Haider 2015: 140). This entails an Open innovation approach (Baldwin & von Hippel 2011: 1400-1401, see also von Hippel 2017) allowing people from all over the World to add comments and innovate together, which can be handled by the structure and processes of big data. This kind of collaborative problem-solving is called crowdsourcing and it might be a solution for tasks that are either too difficult or demanding for an individual to complete (Chen, Mao & Liu 2014: 201). Crowdsourcing has been used within firms, for example Audi has enhanced their research, development and design capacities through distributing the tasks to general public willing to help voluntary, but crowdsourcing can also be extended to the scope of cities or even larger areas through utilizing big data (Chen, Mao & Liu 2014: 201).

New value can be created from ideas that have its origin in data retrieved from reconstructed and merged big data resources (Chen, Mao & Liu 2014: 204). By utilizing big data during the idea generation process, it might provide a way for identifying new markets and suitable innovations intended for use in these markets (Chen & Zhang 2014: 317-318). Additionally, it can be benefitable to utilize different technological devices and support systems in conjunction with big data to help with the collecting, transferring and storage processes. To exemplify, big data

combined with IoT (Internet of Things) allows organisations to gain real time access to data that might provide insights for novel ideas and innovation that provide value to the organization (Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan 2015: 113). As society and development is moving forward at a faster rate it becomes critical for businesses to notice early small symptoms, warnings and signs of the future to come, i.e. weak signals, that will help the company to prepare and react their strategies for the future changes in the market (Holopainen & Toivonen 2012: 198-201).

Challenges

There are some challenges with using big data for idea generation that are related to the general issues of handling large and complex datasets. One might encounter issues with compatibility when combining different kind of data sets from different sources that comes in the form of excessive and irrelevant data and data that behaves in a distinct manner (Chen, Mao & Liu 2014: 203). Additionally, discovering valuable information through big data can be difficult as there exist challenges related to how one collects, store, search, share, analyse and present the data (Chen & Zhang 2014: 318). Furthermore, storage space and costs for big data is a great concern as the amount of data is increasing at a rapid exponential rate, which generally might lead to situations where valuable data is lost (Chen & Zhang 2014: 319).

The possible issue with certain big data is the underlying biases and subjective information that it may, in some instances, contain (Kitchin 2024: 8-9). Therefore, it is important to keep this concern in mind when analysing data and base business decisions of the data, especially when the decisions will affect new and future investments and ventures that are on the agenda. Moreover, sometimes the source of the data might be unknown or not verified, which might lead to poor quality of the data collected (Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan 2015: 110). Lastly, there is always the possibility of obtaining too much of data that are refined into an amount of ideas that are challenging to handle and realize in practice. This risk is especially critical to take into consideration within the process of idea generation and therefore it is important to maintain the focus on the goal and objectives.

If a company is applying an open innovation model for gathering external big data for the idea generation process, then one might encounter risks with possible leakage (Frishammar Ericsson & Patel 2015: 76) of the external open source knowledge and especially the company's own internal knowledge. However, sometimes the combination of external and internal knowledge might lead to challenges of unclarity of the ownership of the data as the borders of internal and external data becomes diffused. Moreover, the external data that is collected might already be under ownership of some other party, which can lead to legal issues about the data ownership (Kostkova, Brewer, de Lusignan, Fottrell, Goldacre, Hart, Koczan, Knight, Marsolier, McKendry, Ross, Sasse, Sullivan, Chaytor, Stevenson, Velho & Tooke 2016: 1-2).

Concept development and test

Concept development and tests can be about prototyping or testing of service blueprinting in practice or laboratory settings. During this phase, in these processes, if correctly managed and monitored, a lot of information can be collected and stored.

Potentials

A lot of potential synergies can be found between big data and Internet of Things-applications, which can be utilized for concept development (Chen, Mao & Liu 2014: 177). Concepts can be tested and analysed by collecting big data using sensor-technology that is applied to smart phones and IoT devices. Especially the availability of real

time data supports concept development and test (Chen, Mao & Liu 2014: 194). By collecting data of consumers' actions, e.g. purchase transaction, through big data instead of their opinions, e.g purchase intent, through a questionnaire or survey, it is possible to obtain more relevant information of what consumers really think and how they finally behave (Auger & Devinney 2007: 377-379). For example, people might respond in a survey that the new packaging and design of a product would not increase their interest in the product, but by collecting data from sales and consumer behaviour it shows that the new design has in fact increased the sales of the product.

Big data can also be utilized for improving development operations arriving from factors within the organization and its products. Big data can potentially be used to detect security threats and safety loopholes in products or services during the testing phase (Chen, Mao & Liu 2014: 204). Additionally, big data can also be used to enhance the transparency and accountability of operations within an organisation and by that support cooperative new service development (Wamba, Akter, Edwards, Chopin & Gnanzou 2015: 243). Furthermore, the process of collecting vast data in form of different opinions can provide alternative perspectives and thus encourage exploring different views and out-of-the-box thinking during concept development.

Challenges

Mastering big data in order to effectively utilize it for product development requires special competence and skills that can be difficult to come by (De Mauro, Greco & Grimaldi 2016: 126-127). However, educating employees or finding talents with adequate know-how and skills for big data can be difficult or time consuming (Chen & Zhang 2014: 321).

Storage and their security options must be carefully evaluated and controlled in order to prevent new concepts and business secrets to leak out to competitors or the general public (Chen & Zhang 2014: 319). The causes of big data security challenges origins from the vast size of the data and the workload it requires for maintaining adequate data security (Chen & Zhang 2014: 321).

In balancing the pros and cons of big data for concept development and test, one must carefully estimate an adequate balance between the quantity and quality of data that is collected (Bello-Orgaz, Jung & Camacho 2016: 46). Additionally, gathering and combining big data from several distinct sources might lead to contradicting results endangering the new service development process (Cai & Zhu 2015: 3). Moreover, visualizing and presenting big data might be difficult if the applications and tools are not able to effectively manage and run the large and complex datasets (Chen & Zhang 2014: 321). Furthermore, modelling problems might occur as there might be a risk on losing the connection of the real relationship of the cause and effect of the matter or the data is not compatible on a cause-and effect level. This means that one might draw the wrong conclusion of the effects of certain data on the other, thus the real cause remains unknown. Lastly, in contrast to the previous mentioned potential of utilizing opinionated data for obtaining alternative perspectives for concept development, the more people and opinions involved, the more interpretations there are, thus this can create a situation where it can be difficult to be able to make decisions on the matter at hand.

Launch and follow-up

During the launch phase the product or service is introduced to the market and potential customers by providing them an access to the product or service for the first time. This phase should be carefully planned and executed in order to provide the product or service a successful start. Moreover, a monitored follow-up is critical for a sustainable continue of the life of the product or service. Like the test phase, managers can, in the launch and follow-up phase, monitor its success and act in case of unexpected market reactions.

Potentials

Big data can be applied to many different sectors for launch and during follow-up, which makes it possible to optimize business operations and gain a competitive advantage (Chen, Mao & Liu 2014: 198). This provides the potential to have access to information in real time for allocating assets for optimal efficiency of business operations during launch and follow-up (Wamba, Akter, Edwards, Chopin & Gnanzou 2015: 243). In addition, the Big data that is collected can potentially be borrowed or sold to other parties as some information can be valuable to them even if it is not for the data holder (Chen, Mao & Liu 2014: 204).

There exist several techniques that can be applied when collecting and analysing big data from user-generated content (UGC). Using big data techniques, such as sentiment analysis of opinions in text format, it is possible to get comprehensive data on consumers' opinions about the product and its characteristics (Gandomi & Haider 2015: 140). Other big data techniques, such as audio analysis of customer calls, can be used to discover unknown underlying issues of a service, thus providing the possibility of solving this issue and enhancing the service for the future (Gandomi & Haider 2015: 141).

IoT applications combined with big data allows companies to monitor and analyse their services and products after launch in order make adjustments that makes them more efficient and optimized (Chen, Mao & Liu 2014: 198). To exemplify, the installation of IoT applications into a smart city can provide the city with valuable big data that can assist in decision making regarding city's services and their possible enhancement (Chen, Mao & Liu 2014: 198). It is possible to apply IoT sensors into several different locations and situations for the purpose of collecting big data in real-time which will provide valuable insights for companies, organizations and cities (Sun, Song, Jara & Bie 2016: 769). Furthermore, big data might also be used to discover the most optimal price point for services which will in turn benefit both the organisation and its customers in the end. Additionally, the data can help organisations with identifying sectors where resources should be allocated to in order to maximize efficiency of operations (Chen, Mao & Liu 2014: 202).

Challenges

With a new service on a new market the amount of data might be unexpected and therefore companies should be prepared. For example, storing and utilizing vast amount of big data requires adequate IT systems (De Mauro, Greco & Grimaldi 2016: 125). In the same vein, handling and processing of big data has its challenges and one might encounter issues when transferring and converting big data (Chen, Mao & Liu 2014: 202-203). Consequently, organisations might have to invest in data centres to be able to continue using big data adequately in the future (Chen, Mao & Liu 2014: 178). Nevertheless, the challenge today is to keep the big data processing systems up to date with the rapid increase of data that is created every second (Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan 2015: 112).

The quality of the data is also important as lower quality data decreases the impact of value creation (Chen, Mao & Liu 2014: 203-204). In this respect it becomes important to educate all employees about big data within an organisation in order to prevent trust issues and gain the full potential of the value it provides (Wamba, Akter, Edwards, Chopin & Gnanzou 2015: 243). However, processing and transforming big data into usable and valuable information requires a lot of time, therefore the time aspect is critical to consider when planning to utilize big data in business operations (Cai & Zhu 2015: 3). Moreover, the possible issue with collecting data later or withholding collected data for a long time is that the data might get outdated and invalid, which in turn might negatively affect decision-making in organisations (Cai & Zhu 2015: 3).

3.2. Big data for customer insight development and marketing

This section discusses big data potentials and challenges within areas of marketing and customer insight development, which often are post-launch activities when the product is already on the market. Big data utilization within these areas provides critical data and insights on how well the product or service fares on the market and how it's success can potentially be improved. This section will first investigate the potentials and challenges of big data within customer behaviour, which is then followed by big data in marketing settings.

Customer behaviour

It is possible to get valuable insight about consumers by studying their behaviour. Consumer behaviour consists of the actions the consumers take before, during and after a purchase transaction has been made. By studying the process of why, when and how people make a purchase decision, it is possible to gain critical data on how to improve a company's marketing activities and ultimately boost sales. (Horner & Swarbrooke 2016: 6)

Potentials

Big data can be utilized for collecting data and observing customer behaviour both physically in stores, through facial recognition technology and digitally on websites by monitoring clicking behaviour (Gandomi & Haider 2015: 138). The collected data can present ways and points of improvements for these situations. Furthermore, valuable data on customer behaviour in stores can nowadays also be acquired through the use or surveillance cameras (if accepted) where the recorded videos of big data are analysed (Gandomi & Haider 2015: 141). The analysis might provide understanding on how to enhance customer experience and marketing activities in stores. For example, store planning can be improved as well as product positioning.

Big data can also be used to collect opinions from consumers on social media, which might provide valuable information for business strategies and decision-making (Bello-Orgaz, Jung & Camacho 2016: 52). The collection and analysis of this kind of data can be processed in real time and can greatly help companies to understand better their customers and their needs and thus providing the opportunity to respond to these needs in a relatively short time frame (Cai & Zhu 2015: 1). On the contrary, if big data is collected over a longer time span it is possible to obtain a larger and clearer picture of how trends and consumer behaviour changes over time (Batty 2013: 277).

Big data provides the possibility to even predict customers future decisions based on their consumer behaviour offline and online (Gandomi & Haider 2015: 143). By being able to predict consumer behaviour it provides the opportunity to foresee possible coming trends and the provide time to react to these trends accordingly (Chen, Mao & Liu 2014: 198). In addition, applying big data processes to IoT devices and systems provides the possibility to more efficiently predict and match supply with demand (Batty 2013: 278). This enables store managers to make "optimization" decisions. Moreover, big data can also be utilized to foresee the success of a product and what components is required for increasing the likelihood of this success. To exemplify, Netflix collects and analyses the watching behaviour of their customers in order to gain insight in what combination of factors, e.g. actors, directors and genre, are necessary to create a show that has a great potential to succeed before the production has even began (Kumar 2013).

Challenges

The variety and complexity of big data concerning consumer behaviour is increasing and thus processing, combining and analysing this data can be challenging (De Mauro, Greco & Grimaldi 2016: 125). For customer experience and convenience, it is important that the data is timely collected and used. Moreover, big data of consumer behaviour can come in various forms, which might prove it difficult when it is transformed into a suitable form for analysis (Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan 2015: 110). Additionally, the big data of consumer behaviour is collected from several various sources and therefore the data is quite heterogenous and it might be challenging to connect the different data with each other (Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan 2015: 111). These challenges concerning the size and scope of big data signals the importance of significant technological investment, especially so when large amounts of different types of big data are stored and transferred between systems (De Mauro, Greco & Grimaldi 2016: 126).

Regarding challenges on security and regulations, with a notice on GDPR, companies must nowadays put a lot of emphasis on how they store and handle consumers' private information (De Mauro, Greco & Grimaldi 2016: 127). For this reason, companies must contemplate the applicable laws and regulations when collecting big data from consumers, especially when the data is concerning consumers from abroad on international markets (Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan 2015: 111-112). The risk of possible data leaks of consumer private information might be very damaging of consumer trust against the organisation (Chen, Mao & Liu 2014: 203). Therefore, the big data acquired from consumers must be encrypted properly, which can be difficult as the data is usually very vast and diverse (Chen, Mao & Liu 2014: 204).

Marketing

Big data has great potential for enhancing marketing activities. Data from several different areas, such as consumers, competitors and pricing, can be combined and analysed for providing insights and better understanding of the market. Moreover, the marketing activities themselves, such as online advertising, can utilize big data for making these processes more efficient.

Potentials

Big data collected from consumers' personal mobile devices such as smart phones can be used to customize suitable advertisement in real time towards everyone individually (Gandomi & Haider 2015: 138). Personalizing communication and advertisements to potential customers is cost-saving for both the company and the consumer and might in some cases increase the success-rate of the customer being influenced by the message and acting upon it (Tran 2017). Moreover, big data in the form of community detection provides the possibility to improve the recommendation systems used on web sites or social media (Gandomi & Haider 2015: 142-143). As mentioned before, data can be collected over a long period of time (Batty 2013: 277), which enables the possibility of longitudinal studies or long-range experiments of the effects of marketing activities. This kind of approach might reveal important cause and effect relationships that can also be measured using big data analysis.

Challenges

One challenge of big data and marketing concerns the confidentiality of big data and how it can be an issue if the information is utilized in outsourced marketing activities (Chen, Mao & Liu 2014: 175-176). Therefore, yet again it is important for organisations to ensure that their systems and security are up to date and that they to comply with

current regulations. Another challenge is related to the process of discovering valid and suitable data from social media to analyse as it can sometimes be difficult as the big data is very heterogenous in nature (Bello-Orgaz, Jung & Camacho 2016: 46).

4. How to make sense of Big Data - Some models to follow

The following three models can be considered as tools for understanding big data and they provide different perspectives on how one can perceive big data and utilize it within business settings. The marketing mix model will provide an understanding on what and where data can be collected from and for what purposes it can be applied. In contrast, the product life cycle model will suggest appropriate times of utilizing big data for different business purposes during the product's life. Lastly, the AIDA model will demonstrate how the process of big data collecting and application works in an online environment within the area of consumer behaviour.

4.1. Marketing Mix and big data (Where and what?)

The marketing mix (see Figure 1) is a major and established marketing concept that organisations can use as a tool of support for their marketing plan and activities. Kotler and Armstrong, (2010: 76) defines the marketing mix as "the set of controllable, tactical marketing tools that the firm blends to produce the response it wants in the target market". The marketing mix may contain different number of elements or perspectives (Khan 2014: 95-98) ranging from four to twelve elements. However, the framework used in this context will include the following five perspectives (5P); people, product, promotion, price and place.

Figure 1 - The 5P of the Marketing Mix

First, the people perspective is often referred to the personnel or employees of an organisation (Khan 2014: 104), but within this framework this element will instead encompass the consumers. The potential customers of a product or service can be segmented into groups of further profiled into distinct individuals. Second, the product perspective is referring to the product or service that a company is offering to consumers for their use. This includes all the

components and services that the product consists of that might arrive after the purchase transaction, such as installations or warranties (Riaz & Tanveer: 2012: 44). Third, the promotion perspective consists of the marketing activities that communicates the selling points of the product or service and influences the consumer to make the purchase. Promotion can include activities such as advertising, personal selling, public relations or sales promotions (Khan 2014: 101-102). Fourth, the price perspective comprises of the amount that the consumer will have to pay for the product in order to obtain, use or consume it. The price is a critical factor for consumers' purchase decision and the element is often determined according to the other elements (Khan 2014: 99). Finally, the place perspective is referring to the distribution of or the location of the goods and services where they will be available for the consumers (Kotler & Armstrong 2010: 76). Multiple locations or channels can be used for distribution of the products or services (Riaz & Tanveer: 2012: 46).

In the following framework (see Figure 2) by Fan, Lau & Zhao (2015: 29) the 5Ps of the marketing mix has been combined with the process of big data collection, method of analysis and suitable application purpose. Each of the perspective contain specific big data that can be collected followed by the appropriate method of analysing this data for the purpose to transform it to a form that can provide support to a certain business decision-making or operations, especially for marketing intelligence purposes. The framework provides answers on *where* big data can be collected from and *what* kind of big data can be found there and for what purpose.

Figure 2 - A marketing mix framework for big data management (Fan, Lau & Zhao 2015: 29).

	People	Product	Promotion	Price	Place
Data	• Demographics • Social networks • Customer Review • Click Stream • Survey Data	• Product characteristics • Product category • Customer Review • Survey Data	• Promotional Data • Survey Data	• Transactional Data • Survey Data	• Location-based social networks • Survey Data
Method	• Clustering • Classification	• Association • Clustering • Topic Modeling	• Regression • Association • Collaborative Filtering	• Regression • Association	• Regression • Classification
Application	• Customer segmentation • Customer profiling	• Product ontology • Product reputation	• Promotional marketing analysis • Recommender systems	• Pricing strategy analysis • Competitor analysis	• Location-based advertising • Community Dynamic Analysis

Data

The framework and process begin with locating the source of the data from the five perspectives of the marketing mix. This step of the framework provides information on where particular type of big data can be found and what kind of data collecting method would be suitable. If one requires to obtain data on consumers then this data can potentially be found from the people perspective by using data collecting methods such as demographics, social networks, customer reviews, click stream and surveys. For information about the product or service itself, one should investigate the product perspective and collect data from product characteristics, product category, customer review and survey data. The data acquired from this area can provide insights on how to tune or modify the product or service offerings to better serve the customers. The next perspective is promotion from where

promotional and survey data can be collected for information about promotional strategies and their effectiveness. Subsequently, the price perspective provides information about the pricing of the product or service and this data can be collected from transactional and survey data. Finally, collecting data from location-based social networks and surveys can provide insight on the place perspective by examining the effectiveness on advertising in relation to its location. (Fan, Lau & Zhao 2015: 29)

Method

The next step in this framework process is method in where the suitable data mining techniques for analysis must be chosen according to the type and characteristics of the data and what kind of issue is to be solved. The framework has listed some of the main data mining techniques that could be suitable for the data collected from each perspective concerning the application in the final step in the process. Clustering can be used for data collected from the people and product perspectives for descriptive purposes, while classification technique is often appropriate for data from the people and place perspectives for predictive applications. Moreover, association technique could be suitable for the product, promotion and price perspectives if a description is desired, whereas the promotion, price and place perspectives would require a regression-analysis for prediction. In addition, in some cases topic modelling might be an adequate technique for product data if a product ontology is meant to be built from text data from social media. Finally, collaborative filtering could be a suitable method for data on promotion if the purpose is to create a recommender system for enhancing awareness and promotions. (Fan, Lau & Zhao 2015: 29-30)

Application

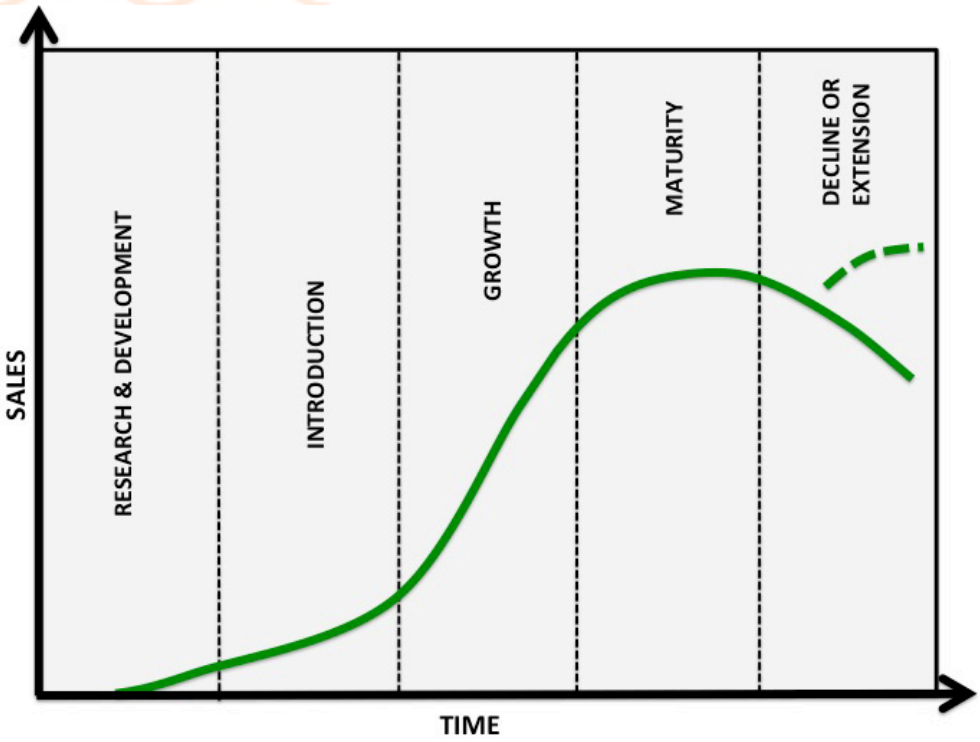
The method is finally followed by the application of the big data. The application is the result of the combination of the data and methods of each perspective that have previously been described. The combination of data and method choices from the people perspective can contribute in segmentation and profiling applications where potential customer groups or individuals can be identified and associated to a certain product or service according to their traits, interests and tastes. From product data one can create product ontology and a system for product reputation management for continued monitoring of a company's distinct products. Ontology is referring to how one perceives and makes sense of the real world (Saunders, Lewis and Thornhill 2016: 127). By collecting data of consumers' opinion about the product makes it possible to create an ontology of the product, which helps companies to define, classify and make sense of how the consumers perceive the product. This information in turn can provide suggestions on how to tune the offering of the product. Within the promotion perspective it is possible to conduct a promotional marketing analysis and build a recommender system for improving awareness. Subsequently, the data collected from the price perspective can be utilized for competitor analysis in addition to it providing the organisation an improved pricing strategy. Finally, place data can be critical for businesses nowadays as it enables the marketer to take advantage of location-based advertising in addition to the data being utilized for community dynamic analysis. (Fan, Lau & Zhao 2015: 29-30)

4.2. Product life cycle and big data (When and why?)

The product life cycle (see Figure 3) is a marketing model that contain a series of stages of a product's or service's life in relation to the sales beginning with research and development, followed by introduction, growth and maturity to finally end with the stage of saturation and decline (Kotler, Wong, Saunders & Armstrong 2008: 571-572). The model helps companies to plan their product strategies in a long-term period and it can be used as a tool to forecast

the necessities of incoming marketing activities (Orcik, Tekic & Anisic 2013: 44). The pattern in the model can differ depending on the type of product and the market it belongs to. However, this bell-shaped pattern is the most common product life cycle pattern and it is suitable for most products (Kotler, Keller & Cunningham 2012: 310).

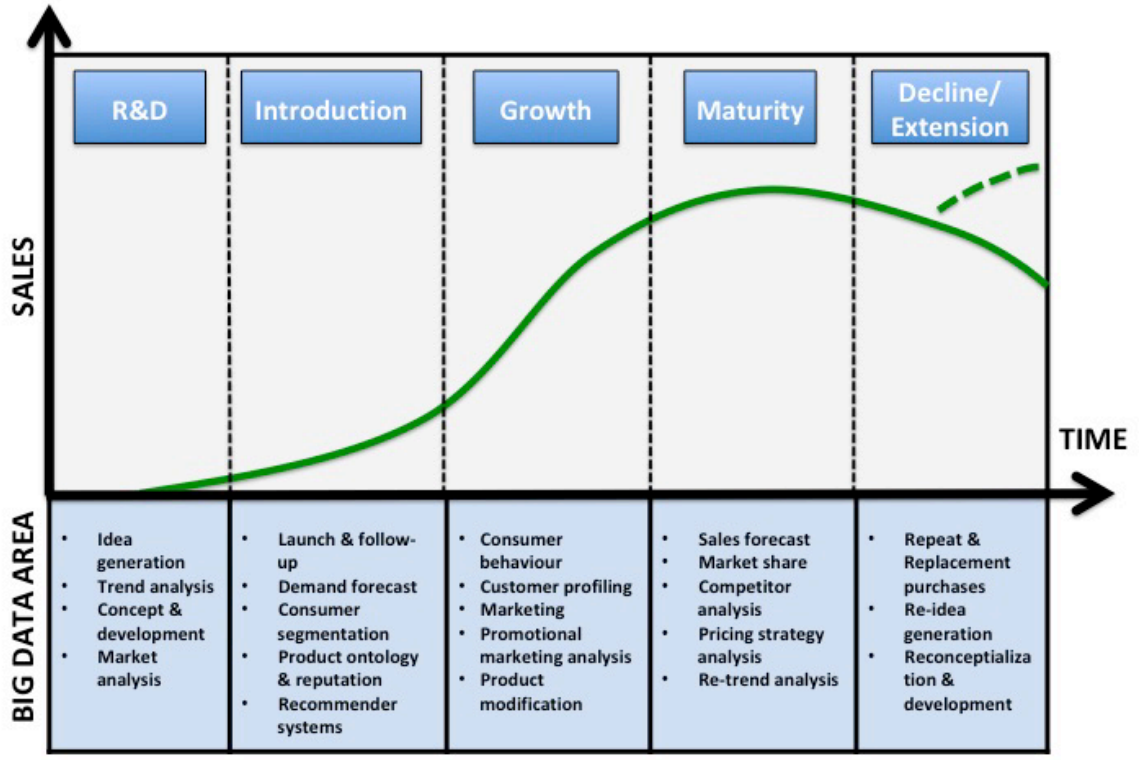
Figure 3 - The product life cycle.



The stages of the product life cycle pattern used in this framework are in the order of research and development (R&D), introduction, growth, maturity and decline or possible extension. Within the R&D stage the product or service is being developed, which means that during this period there usually are no sales at all. The next stage, introduction, begins once the product is ready for launch, which requires investment in marketing for the sales to take off. The product enters the growth stage when the sales are increasing, and the product is starting to gain market share. When the sales start to slow down and the market becomes saturated, the product has reached the maturity stage. This stage is often characterized with high sales and returns, but also with the presence of competing products, thus measures must be taken in order to further extend the life of the product. The product has entered the decline stage once the sales begin to decrease, if the company has not managed to successfully extend the product's life. This decline could be caused by a saturated market, fierce competition or change in trends and economic conditions. (Orcik, Tekic & Anisic 2013: 44)

Figure 4 combines the product life cycle model and big data utilization. The framework demonstrates at what time of the product life cycle certain type of big data activities would be relevant and useful for the company. The product life cycle can provide an indication on what kind of strategies and areas of business that could be suitable in a particular stage of the product's life cycle (Anderson & Zeithaml 1984: 6). Each stage of the products life cycle contains some suggestions of big data areas that companies could and should invest in for obtaining information that could help with business processes relating to the product or service at that stage of its life. These activities are merely suggestions that can also be appropriate within other life cycle stages depending on the business and product itself. This framework provides answers on *when* a specific kind of big data usage is relevant and *why* this data usage is helpful at this certain time of the product's or service's life.

Figure 4 - Product life cycle model combined with big data utilization.



Research and Development

The product's life begins at the research and development stage where essential data required for a successful product are found within areas of idea generation, concept and development, market- and trend-analysis. The big data collected in this stage should assist in innovation processes and help the company to analyse the current market and customer preferences and use this information to create a product that meets the market and consumer needs.

Big data can be used as an inspiration for the idea generation process of the product by identifying emerging trends and hot topics, warnings and weak signals of the future (De Mauro, Greco & Grimaldi 2016: 124, Holopainen & Toivonen 2012: 198-201, Gandomi & Haider 2015: 140). Moreover, knowledge and ideas can be externally shared and collected by using collaborative and open crowdsourcing and big data and later internally communicated within the firm (De Mauro et. al 2016: 127, Chen et. al 2014: 201). During concept and development phase big data can help to improve the product by detecting safety and security issues in an early testing phase (Chen, Mao & Liu 2014: 204). Furthermore, the data can support a more transparent and accountable organisation environment and structure (Wamba et. al 2015: 243). Finally, big data can be utilized for market analysis to identify new and suitable markets for the product or service that is being developed (Chen & Zhang 2014: 317-318).

Introduction

The life cycle continues, and sales start to slowly rise at the introduction stage where the product is officially introduced to the market for the first time. During the introduction stage the company should focus on the customer and advertising activities in order to increase the purchase frequency of the product. Additionally, data to use for

further developing and enhancing the product should also be collected during this stage (Anderson & Zeithaml 1984: 6). Key activities at this phase includes the product launch and monitored follow-up of its success, therefore it is critical for the company to gather relevant data from product reputation and ontology studies, make forecasts of the demand and segment its consumer base. The consumer data from the segmentation and the product data from product reputation and ontology can be utilized for develop recommender systems to be used on social media platforms.

Real time big data helps in keeping track of inventory and assets, thus allocation of these can be optimized during the whole product's life cycle, especially during the critical launch (Wamba et. al 2015: 243). It is important to be observant during the introduction stage and follow-up by carefully listen to feedback and act upon it by adjusting the product or service (Chen et. al 2014: 198). Therefore, gathering data of user-generated content from social media in text and audio format through sentiment analysis and audio analysis are helpful processes for obtaining and analysing relevant feedback (Gandomi & Haider 2015: 140-141). Demand forecasting is very important for predicting real and precise sales figures, especially for a product launch, in order to have efficient operations for inventory management and order processing for meeting supply with demand (Yue, Wangwei, Jianguo, Junjun, Jiazhou and Aiping 2016: 827). Therefore, big data can help companies to estimate very accurate predictions, for example for an upcoming product's sales based on the amount and nature of tweets on the social media channel, Twitter (Lassen, Madsen & Vatrapu 2014). Segmentation of a products consumer base is highly important for establishing efficient marketing activities. Through proper segmentation, with the help of big data, one can identify and cluster specific groups of consumers that share similar preferences and interest. These groups can be further clustered into a particular part of the life cycle (Fan, Lau & Zhao 2015: 29-30).

Big data makes it possible to automatically manage, collect and analyse written texts and posted pictures on social media and the web for retrieving data on the reputation of the product (Fan, Lau & Zhao 2015: 30). In addition, the gathered data can be utilized for creating product ontologies, which can be applied as a base for marketing and business intelligence operations (Fan, Lau & Zhao 2015: 30). Gathering consumer and product data from online communities and social media (Bello-Orgaz, Jung & Camacho 2016: 52) provides valuable information for constructing and enhancing recommendation systems on online platforms, which in turn supports the collection of user feedback (Gandomi & Haider 2015: 142-143). Recommender systems can be used to promote and suggest a product or service to possible customers in addition to that they generally also strengthen the awareness of the product (Fan, Lau & Zhao 2015: 30).

Growth

The next stage, growth, has been reached when the sales starts to greatly increase. In the growth stage one should emphasize on the customer needs and further modify the product accordingly to meet these needs. Moreover, the company should look into further segmentation strategies and how to improve production and marketing of the product (Anderson & Zeithaml 1984: 8, 22). At this stage of the cycle it is important to continue investing in marketing activities and carefully observe and collect data from the market and consumers through consumer behaviour and promotional marketing analysis. These analyses can help in activities related to the product or customers such as customer profiling and product modifications.

Observing consumer behaviour by collecting and analysing big data of their physical in store and virtual online behaviour can provide current points of improvements and insights of how the customer experience can be enhanced, which will lead to growth in sales (Gandomi & Haider 2015: 138, 141). Additionally, the analysis of consumer behaviour might also provide prediction of their future decisions and trends, thus providing time for proactively react to the coming changes (Gandomi & Haider 2015: 143, Chen et. Al 2014: 198). Furthermore,

during the growth stage it is critical to effectively meet supply with the demand though the data that the analysis reveals (Batty 2013: 278). Now after that the product have been introduced to the market, sales have been made and the initial customer data has been aquired it is possible to profile the individual customer. The real-time generated transaction and customer data online makes it possible to profile and target the suitable customers and suggest the most suitable product or service for them (Fan, Lau & Zhao 2015: 29-30). Furthermore, through the information that big data provides it is possible to customize and personalize the marketing messages and advertisements that are sent to potential customers in order to increase the chance of the consumer being influenced by the advertisement (Gandomi & Haider 2015: 138, Tran 2017). Marketing promotions and analysis of these activities are vital for firms for increasing sales and revenue. The promotional marketing analysis provides information on how consumers react to different promotion strategies and gives insight in how these promotional activities can be made more efficient. The data is collected through logs online, which is a common data collecting method for transactions that a big data environment efficiently supports (Fan, Lau & Zhao 2015: 30).

Finally, it is possible to reveal underlying opinions of products and their characteristics by collecting big data of consumers' actions, such as purchase transactions, instead of what consumers answer in a survey (Auger & Devinney 2007: 377-379). These actions can be analysed in order to find out points of improvements or modifications of the product or service. Moreover, the data can help to foresee the component combinations that would potentially lead to a guaranteed successful product or service offering among a consumer group (Kumar 2013).

Maturity

The maturity stage has been reached when sales start to stagnate. During the maturity stage the company should concentrate on increasing the market share and strengthen the market dominance (Anderson & Zeithaml 1984: 8). It is critical for companies to also observe trends, watch for signals of change and plan ahead accordingly even though the sales and returns of the product are currently high. Therefore, companies must collect data and conduct sales forecasts, market share, competitor, trend and pricing strategy analysis in order to be able to successfully extend the life of the product.

The enormous datasets available from social media platforms can be strategically utilized for making very accurate sales forecasts (Lassen, Madsen & Vatrapu 2014: 10). These forecasts can provide indications on when sales are starting to decrease, and the product's life cycle is moving to the decline stage. For market share analysis, big data can provide an input by gathering data of the market and presenting the current market share of the company. However, big data can potentially be also used in increasing the market share by obtaining key information about consumer behaviour, competitors and optimal pricing and acting accordingly (Bughin, Livingston & Marwaha 2011). A strict competitor analysis only is conducted to identify the potential company competitors and competitive products. This process can be made automatic through the help of big data (Fan, Lau & Zhao 2015: 30). Finding the right price point can be challenging, however, big data in the form of log data through pricing strategy analysis can help in discovering the optimal price for the product at that certain time, thus making the pricing dynamic (Chen, Mao & Liu 2014: 202) as different pricing strategies are suitable for different times and situations (Fan, Lau & Zhao 2015: 30). As mentioned, at this point of the products life cycle it is advisable for the company to also investigate the future of the market and conduct a trend analysis again. Through this analysis the company can get insights on upcoming trends and be warned of future challenges and difficulties (De Mauro, Greco & Grimaldi 2016: 124, Holopainen & Toivonen 2012: 198-201, Gandomi & Haider 2015: 140). If the company has from the beginning continuously collected trend and consumer data, it is possible to acquire better and whole picture of how the trends changes (Batty 2013: 277).

Decline

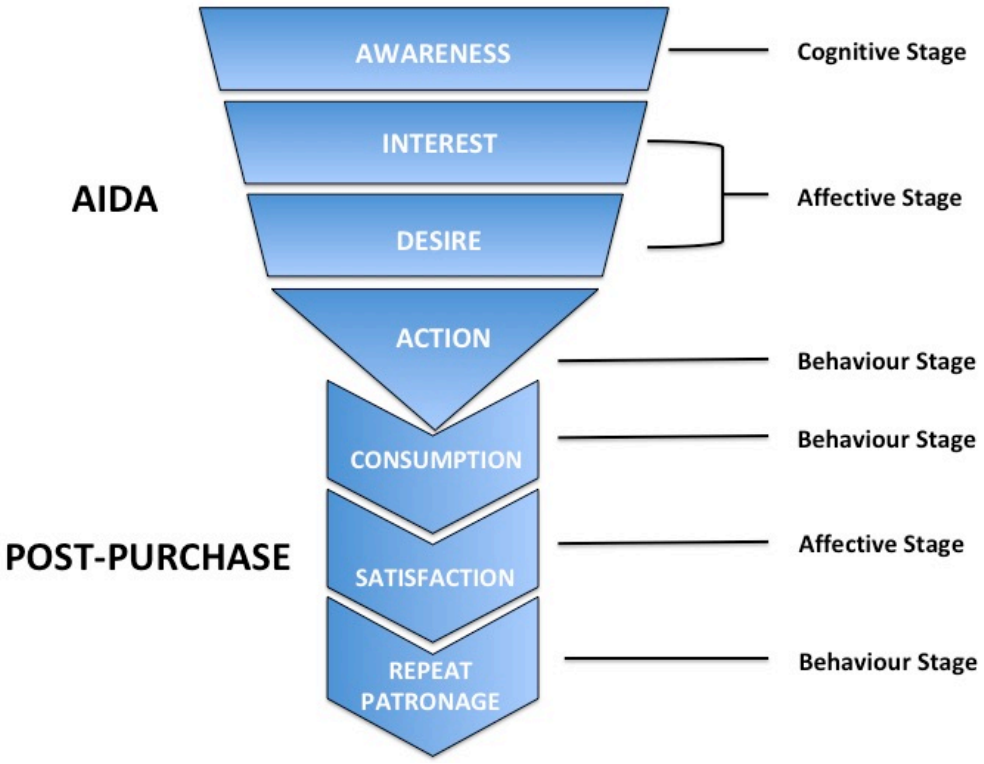
The product life cycle either ends or is extended in the last stage depending on the actions that the company takes. The strategies and tactics available for the decline phase depends on the current state and characteristics of the industry, competition and demand (Anderson & Zeithaml 1984: 8). In addition, the company's long-term objectives and goals must be considered. For possible extension tactics one could observe big data of repeat and replacement sales or gather data for re-idea generation and reconceptualization development of the product.

Analysis of data from repeat and replacement purchases can provide estimations and forecasts of current and upcoming sales (Guo 2014: 213-215). The importance of these kind of sales increases to the end of a product's life cycle as the market is saturated and new consumers are difficult to obtain. However, at the decline stage it might be recommended to invest in new products and services, thus focus should be pointed to research and development again. The same tactics used in the R&D stage are also relevant for the re-idea generation and reconceptualization, but a new kind of fresh perspective is required. The previously gathered data from the market, consumers and upcoming trends can provide insights for novel ideas and innovations that can be implemented to the current products or services in order to create new value (Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan 2015: 113).

4.3. AIDA and big data (How?)

AIDA is a marketing communication model that explains how advertising affects consumers' cognitive, affective and behavioural activity, and the model describes the components in the process that leads to a desired action, e.g. purchase transaction, for the marketer (Hassan, Nadzim & Shiratuddin 2015: 265). The AIDA model can be continued by post-purchase behaviour and affections that may potentially occur after a purchase. The whole process beginning with AIDA and continued by post-purchase activities are illustrated in Figure 5.

Figure 5 - AIDA model continued by post-purchase activities.



The components of AIDA are *Attention/Awareness, Interest, Desire and Action* (Lee & Hoffman, 2015: 9), and the consumer usually follows these steps in the mentioned order, although other patterns of the effects are possible (Hutter, Hautz, Dennhardt & Füller 2013: 344). The process in short begins with the advertisement catching the attention of the consumer who becomes interested in the product and starts to desire it thus finally buying the product (Hassan, Nadzim & Shiratuddin 2015: 265). The consumer's purchase process can be continued after the AIDA model by studying the consumer's post-purchase behaviour that may often involve elements such as consumption, satisfaction and repeated patronage (Wijaya 2015: 79, see also Lemon & Verhoef 2016: 76). These elements can be important for the company to understand the consumer, obtaining data for further product improvements and keeping the consumer as a recurring customer in the future (Lemon & Verhoef 2016: 76).

In the following framework (see Figure 6), using an online advertisement on social media and an online store as an example, it is demonstrated how the AIDA model and post-purchase behaviour can be linked to big data and what kind of information and statistics can be brought out for further analysis. The framework should provide an understanding on *how* the consumer purchase behaviour works in detail and what elements are included in the process. It is possible to track, collect and store data of this kind of behaviour within an online environment that is exemplified in this framework.

Figure 6 - Example of AIDA + Post-purchase model combined with big data.

Stages	AIDA + Post-purchase	Big Data (online ad example)
Cognition	Awareness	Data of consumer seeing ad.
Affect	Interest	Data of consumer clicking/reading the ad.
Affect	Desire	Data of consumer searching more about the product/ going to the online store.
Behaviour	Action	Data of consumer purchasing the product.
Behaviour	Consumption	Data of consumer using the product (digital).
Affect	Satisfaction	Data of consumer posting a review of the product.
Behaviour	Repeat patronage	Data of consumer purchasing again.

AIDA process

The process begins with the consumer's cognition stage where the company's advertisement, for example on Facebook, is seen by the consumer and thus the consumer will become aware of the brand, product or service that is advertised. This occurrence of the consumer seeing the ad can be registered and stored to the big data bank. If the advertisement is successful on providing a desired effect, then the consumer becomes interested and clicks on the advertisement to read about the product. The action of a click on the ad is also registered and stored. This affection of interest is potentially followed by the consumer's desire for the advertised product and consequently the consumer will click on a link that directs the consumer either to a website for more information or directly to the online store where the product can be bought. This link click is also registered and stored and can for example be seen on the website's Google Analytics tool screen, which shows that the consumer was directed to the website through the ad on Facebook. The last step in the AIDA model is realized by the behavioural action of the consumer when the consumer makes a purchase transaction on the company's online store, which is registered and stored for potential big data analysis.

Post-purchase process

The process can be continued further on from the AIDA model by following the consumer's post-purchase behaviour. In some cases, e.g. with digital products or services, it is possible to receive data on the consumer's consumption of the product. In addition, the consumer can be encouraged to provide data, e.g. in form of a review, of the satisfaction that the consumer obtained from the product. This data can for example be acquired by sending an automated follow-up email to the address used during the purchase transaction. Finally, if the consumer has registered an account on the company's online store, it is possible to obtain data of repeated patronage, which is usually an indication on that the previous transaction was satisfactory.

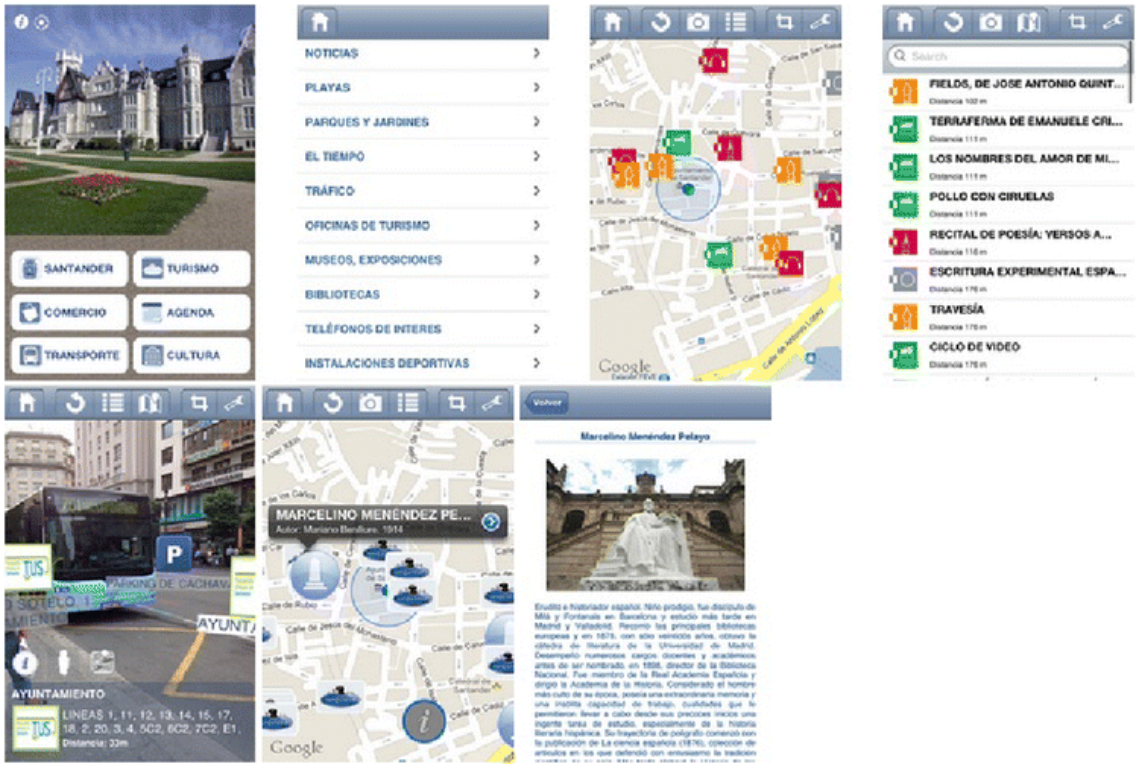
5. Big Data for business development – selected cases

The following four cases are selected as an example of how big data can be applied for business development in practice within the area of tourism. The cases of Santander, Trento, Barcelona and Åre all presents distinct ways and areas of big data application that has improved some parts of the tourism business, such as brand image, user experience, user generated content data collection, or open data source management and utilization.

5.1. Santander – Open municipal big data motivating innovative applications

The city of Santander has collected municipal big data from different sources, such as agencies, employees and public, which they have stored in one single large open data hub for analytics. The data have been left available in an open format for the use of developers, which provides the opportunity for the developers to use and modify all the big data, such as flow of traffic, environmental conditions and public engagement of city services, in order to create applications that benefit the city, companies, the citizens and tourists. The open availability of this big data lead to the creation of the augmented reality app, SmartSantanderRa (see Figure 7), which provides a vast amount of relevant and real time information of the city for the citizens and tourist, such as weather reports and forecasts, public traffic timetables, real time surveillance camera stream and information about monuments, shops, tourism offices, attractions and other point of interest. (Kitchin 2014: 5-7)

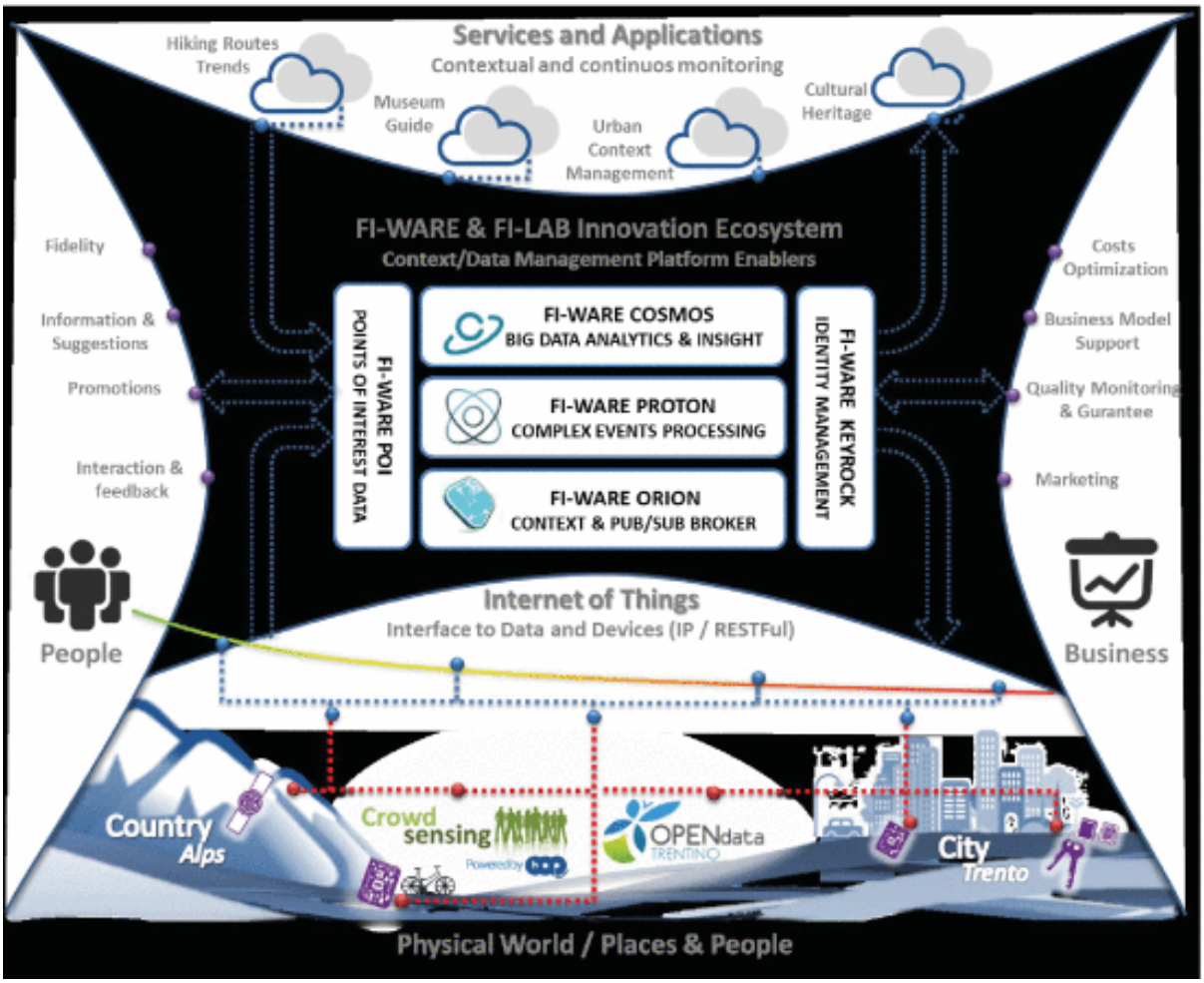
Figure 7 - SmartSantanderRA augumented reality app (Kitchin 2014).



5.2. Trento – Smart and connected communities with Big Data and IoT

In Italy, the city of Trento has used big data combined with Internet of Things in order to develop a solution that enhances a tourist's experience in the city. The solution is called TreSight (see Figure 8) and it is a project where personal sensors, participatory sensing technology and open data management is used in order to create a context-aware recommendation system that benefits both the city and its visitors. The tourist will wear a smart wearable bracelet that is connected to a mobile app, which can gather data of and around the tourist such as the temperature, humidity and involvement levels of the tourist activities. The bracelet interacts with the mobile application and can provide the visitor with contextually relevant and personalized information and recommendation of points of interest, restaurants, attractions, promotions and current weather forecast. In addition, the system will provide the city with insight, outsight and foresight analysis that will help in understanding trends and statistics, e.g. popular hiking routes and weather statistics, social and external factors, and assist in predictions such as the expected number of visitors for a certain event or location. (Sun, Song, Jara & Bie 2016: 769-770)

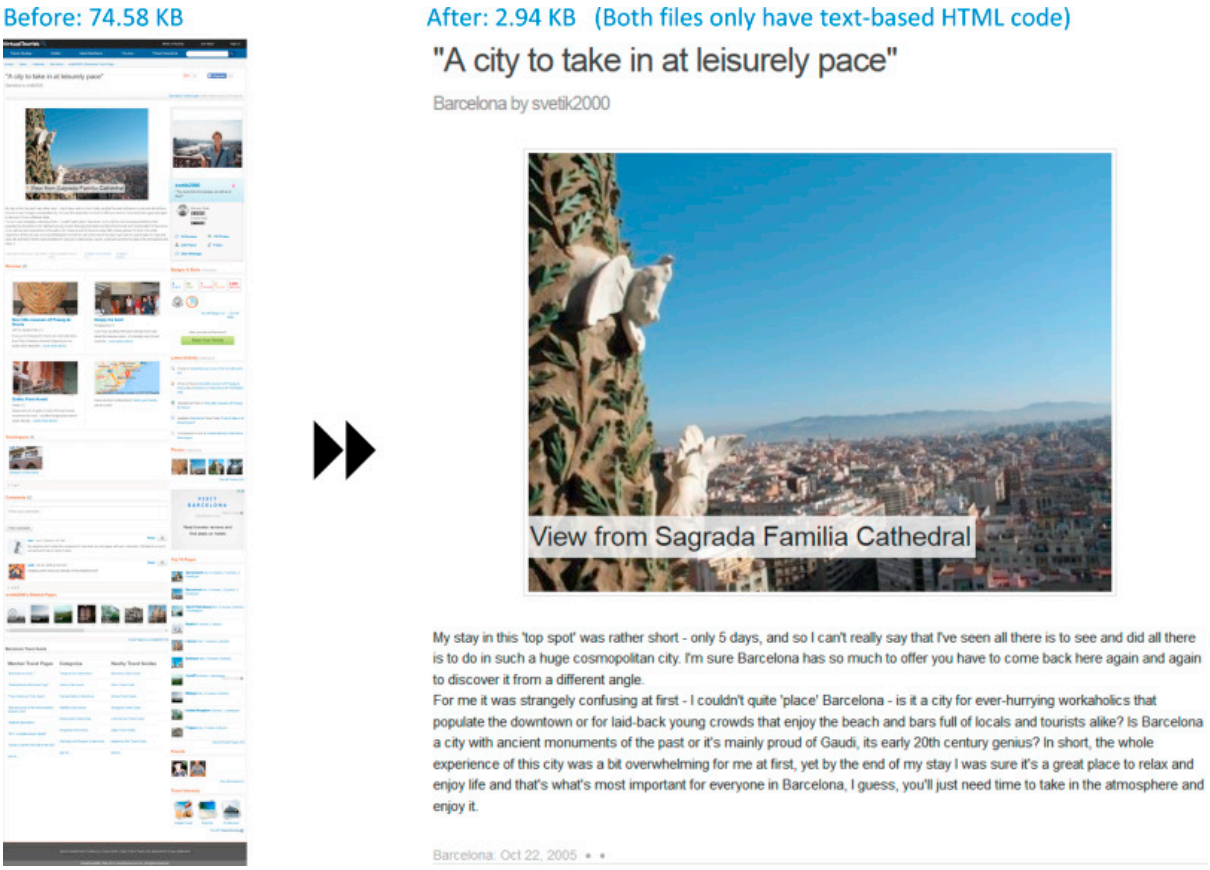
Figure 8 - The Conceptual Architecture of TreSight (Sun et. al 2016).



5.3. Barcelona – Big data analysis over UGC and online brand image

The smart city tourism destination of Barcelona has collected and analysed big data of their online brand image in the form of user-generated content (see Figure 9) found on social media and websites, such as experiences and opinions in the form of reviews and blogs of previous visitors of the city. This process of collecting relevant and freely available textual and quantitative digital data of the content creator, e.g. date of post, nationality, hometown, destinations visited, and the content itself, such as opinions and experiences, reveals the image that Barcelona as a tourist destination has. This process finally helped the city to define its perceived brand image of its visitors. Moreover, the findings have provided knowledge and understanding that are valuable in enhancing the strategies and activities of the tourism management, branding and marketing of Barcelona as an attractive choice of a tourist destination. (Marine-Roig & Clavé 2015)

Figure 9 - VT travel page before and after the cleaning stage (Marine-Roig & Clavé 2015).

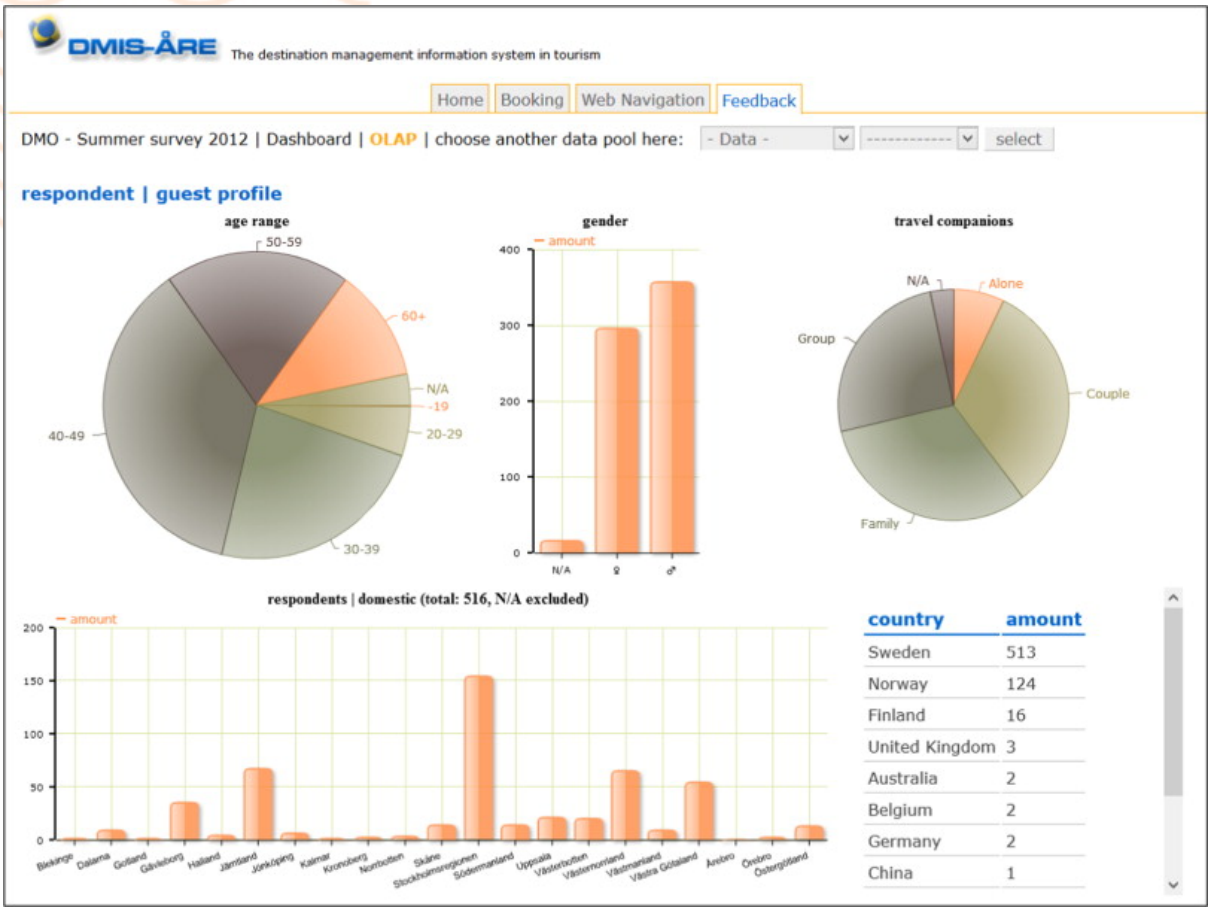


5.4. Åre – Using big data to gain valuable information of tourists pre-and post-travel

The popular mountain tourist destination Åre in Sweden have created a destination management information system, called DMIS-Åre (see Figure 10). This system has the potential to collect and analyse structured (e.g. transactions, rating), unstructured (free text reviews) and rich content (e.g. videos from YouTube) big data in order to gain valuable customer-based data from different digital sources, such as travel websites, booking pages, reviews, blogs and applications, where the traveller have left digital footprints of their activities and behaviour that are related to their travel before and after the trip to the destination. These pre-and post-travel digital footprints include activities, such as how they navigate on the web, their booking behaviour, the transactions they make and what kind of feedback they leave. This system creates the possibility to obtain new knowledge about consumer's

behaviour on websites in real-time that managers at tourist destinations can use to improve the destination services and experience and attract new visitors. (Fuchs, Höpken & Lexhagen 2014).

Figure 10 - DMIS-Åre dashboard: winter survey data (process: Feedback) (Fuchs, et. al 2014).



6. Summary

This paper focuses on to provide an understanding of big data for business development by defining the big data as a concept, discussing its potentials and challenges during different stages of business development, presenting some models on how businesses can better apply big data use for their business, and exemplifying with a few real life cases on how big data has been utilized in practice within the tourism sector.

Big Data is defined as a concept that consists of a huge data set characterized by high volume, velocity and variety, and can be used to create actionable insight for value creation and facilitation. Big data can be applied into the many forms of business development where different potentials and challenges lies. However, this rapport discussed the potentials and challenges within business development areas of idea generation, concept development and test, launch and follow-up, customer behaviour and marketing. Many of potential applications of big data within these areas relate to obtaining a wider and in-depth understanding of the market in relation to the product or service offered. In addition, big data can also be used for enhancing and automatizing the business and marketing activities and processes. In contrast, big data comes with some challenges that commonly relate to handling and storage of data, information security, regulations and ethics, and risk of data leakages.

The rapport presented three basic marketing models and concepts that were combined with big data application. These models provide an understanding of big data and different perspectives on how one can perceive big data and utilize it as a tool within different business situations. The marketing mix model provided answers on what data can be available and where it can be collected. The product life cycle model in turn illustrated when particular type of big data application could be beneficial for the business. Finally, the AIDA model demonstrated how the process of big data collecting and application could look like within an online environment setting.
The paper is concluded with four selected illustrative cases that are real examples of how big data have been applied for business development within the tourism sector. These cases exemplify how, for example, brand image and user experience have been improved in tourist destinations through the use of big data.

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The purpose is to increase the amount of visitors in the region.
The project shall promote growth, not just through internationalisation but also through a conscious focus on digitalisation, research and development, and the opportunities this offers for improving the competitiveness of the tourism industry in this region. Hanken School of Economics will provide this competence in the project.
Read more: kvarken.org/destinationkvarken

Projekt Destination Kvarken ska hjälpa exportmogna små och medelstora företag med fokus på besöksnäring att nå ut till nya marknader för ökad tillväxt och konkurrenskraft.
Syftet är att öka antalet besökare i regionen.
Projektet har genom Hanken Svenska handelshögskolans medverkan starkt fokus på digitalisering, forskning och utveckling inom besöksnäring i regionen.
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Hankkeessa Destination Kvarken autetaan matkailuelinkeinon parissa toimivia vientikelpoisia pk-yrityksiä saavuttamaan uusia, yrityksen kasvuun johtavia ja sen kilpailukykyä parantavia markkinoita. Tavoitteena on lisätä alueen kävijämääriä.
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