



**THE USE OF BIG DATA IN MARKETING ANALYTICS AND ITS INFLUENCE
ON ORGANISATIONS' INNOVATION CAPABILITIES**

Lappeenranta–Lahti University of Technology LUT

Business Administration, Bachelor's thesis

2022

Laura Syrjälä

Examiner: Maija Hujala

ABSTRACT

Lappeenranta–Lahti University of Technology LUT

LUT School of Business and Management

Business Administration

Laura Syrjälä

The use of big data in marketing analytics and its influence on organisations' innovation capabilities

Bachelor's thesis

2023

24 pages, 2 figures and 4 tables

Examiner: Maija Hujala

Keywords: big data, marketing analytics, innovation capability

The power of rapidly growing digital media and data has gained growing attention. As a result, the tools to interpret this huge volume of data have become more complicated, thus creating the need for ways to transform it into information that is useful for companies in terms of gaining competitive advantage. When interpreted correctly, big data can give companies the opportunity to gain unique information about consumer behavior and, by utilizing this, create value and advanced consumer experiences. The purpose of this thesis is to find out how big data is used in marketing analytics and to investigate its real benefits regarding organisations' innovation capabilities.

This thesis was carried out as a systematic literature review, which eventually selected 12 scientific studies. The selected publications are from 2017-2022, ensuring the recency of the information in use. The data of the included studies has been collected from companies and employees from several different countries, representing several different industries.

The aim of this study was to find out how necessary the use of big data is in measuring and enhancing organisations' operations and using the information provided by endless data to optimize marketing activities and innovations. The results of the study provide information on how the relationship between the use of big data in marketing analytics and innovation capability has been studied and about relevant concepts related to this relationship. The results show that the moderate and correct use of big data is beneficial for the company's innovation capabilities, however, underlining the importance of a learning organizational culture and skilled employees in terms of the optimal use and benefits to be gathered.

TIIVISTELMÄ

Lappeenrannan–Lahden teknillinen yliopisto LUT

LUT-kauppakorkeakoulu

Kauppatieteet

Laura Syrjälä

Big datan käyttö markkinointianalytiikassa ja sen vaikutus yritysten innovaatiokyvykkyyteen

Kauppatieteiden kandidaatintyö

2023

24 sivua, 2 kuvaa ja 3 taulukkoa

Ohjaaja: Maija Hujala

Avainsanat: big data, markkinointianalytiikka, innovaatiokyvykyys

Kiihtyvässä kasvussa olevan digitaalisen median ja datan voima on kerännyt puoleensa kasvavaa huomiota. Sen ansiosta tavat tulkita tätä valtavaa datan volyymiä ovat monimutkaistuneet, luoden tarpeen työkaluille, joilla siitä saataisiin jalostettua yrityksille kilpailuedun kannalta hyödyllistä informaatiota. Oikein tulkittaessa, big data voi antaa yrityksille mahdollisuuden saada ainutlaatuista tietoa kuluttajien käyttäytymisestä ja tätä hyödyntämällä saada aikaan arvonluontia ja edistyneitä kuluttajakokemuksia. Tämän tutkielman tarkoituksena on selvittää kuinka big dataa käytetään markkinointianalytiikassa ja tutkia sen todellisia hyötyjä koskien yritysten innovaatiokyvykkyyttä.

Tutkielma on toteutettu systemaattisena kirjallisuuskatsauksena, johon valikoitui lopulta 12 tieteellistä tutkimusta. Valitut julkaisut ovat vuosilta 2017-2022, varmistaen käytössä olevan informaation tuoreuden. Mukana olevien tutkimusten data on kerätty yrityksiltä ja työntekijöiltä useista eri maista, jotka edustavat useita eri toimialoja.

Tutkielman tavoitteena on selvittää kuinka tarpeellista big datan käyttö on mitatessa ja edistäessä yrityksen toimintaa, käyttäessä loputtoman datan tarjoamaa informaatiota optimoimaan markkinointiaktiviteetteja ja luomaan innovaatioita. Tutkimuksen tulokset tarjoavat tietoa siitä kuinka big datan käyttöä markkinointianalytiikassa ja sen suhdetta innovaatiokyvykkyyteen on tutkittu, ja ajankohtaisista käsitteistä tähän suhteeseen liittyen. Tutkimustulokset osoittavat kohtuullisen ja oikeanlaisen big datan käytön olevan hyödyllistä yrityksen innovaatiokyvykkyydelle, alleviivaten kuitenkin oppivan organisaatiokulttuurin ja koulutettujen työntekijöiden tärkeyttä sen optimaalisen käytön ja hyötyjen keräämisen kannalta.

Table of contents

Abstract

1. Introduction.....	1
1.1. Aim of the study and research questions.....	2
1.2. Research method and structure	3
1.3. Theoretical framework	4
2. Big data and marketing analytics	5
2.1. The three V's.....	5
2.2. Marketing analytics.....	6
2.3. Big data analytics	7
3. Big data analytics capability	8
4. Innovation capability.....	9
4.1. Innovation	9
4.2. R&D Intensity	10
5. Research approach	11
5.1. Systematic literature review as a research method.....	11
5.2. Literature search and selection.....	11
5.2.1. Research question.....	12
5.2.2. Database, search terms	13
5.2.3. Screening criteria	13
5.2.4. Search and article selection	14
5.2.5. Analysing the literature and synthesizing results	15
6. Results.....	16
6.1. Big data and innovation	16
7. Discussion and conclusions.....	22
References.....	26

List of figures

Figure 1: Theoretical framework

Figure 2: Stages of research based on the Fink (2010) model

List of tables

Table 1: Inclusion criteria

Table 2: Exclusion criteria

Table 3: The writers and variables in each study

Table 4: Results in positive and negative

1. Introduction

The scenery of digital media has evolved to become more complex than ever before. The continuing and accelerating rate of new platforms, tools, data sources and overall media consumption devices have formed an environment that confuses any marketer. They now face the challenge of recognizing which components of all those choices produce the results needed to reach their digital goals and purposes. (Hemann, Burbary 2018) Nothing would be measurable without data. As Wedel and Kannan (2016) suggest, data has been called “the oil” of the digital economy. The vast data streams provide information on how consumers feel, behave, and interact, and it has given firms opportunities to leverage this knowledge to offer more value, enhanced experiences, and increased satisfaction. This study considers the use of big data in marketing analytics and the actual benefits of utilizing this in organisations.

Combining big data and consumer behaviour, the study of consumer analytics takes shape. When data offers behavioural insights about consumers, marketers have a chance to transform those insights into clear market advantage. Analytics usually indicate the tools that are meant to aid forming the valuable patterns in data. Today, big data is even considered to be an additional form of capital, which benefits many organisations fail to take advantage from. To success in the previous, it is essential for them to invest proper physical, human, and organizational capital resources to big data. (Erevelles, Fukawa & Swayne 2016)

Towards recent years, the power of data and the insight it can give, has been noticed. Big data and marketing analytics are closely associated with one another and when put together, form a powerful tool. It is without a doubt important to measure the impact of the found patterns and findings from the data using analytics, and how organizations use the valuable knowledge from the previous.

Innovation capability will be later described more broadly, nonetheless it measures how a company develops inventions and improves processes and commercializes these. Previous studies (Ghasemaghahi, M. and Calic, G. 2020; Mikalef et al. 2019) have presented adequate results, and this proves the importance of researching and utilizing these tools to improve and optimize the results that come along.

Hao, Zhang and Song conducted a study in 2019, with focus on the relationship with big data and sustainability with innovation and organisational development. Their study used the concept of big data analytics capability (BDAC) to measure the effect of big data on sustainability of innovation and organisational development. BDAC is referring to the company's abilities in managing and utilising big data resources while improving performance. The study offered support to the hypothesis that BDAC has a strengthening effect of big data on sustainability of innovation and organizational development. (Hao, Zhang & Song 2019)

In a study conducted by Alijumah, Nuseir and Alam in 2021, the effect of both traditional marketing analysis and big data analysis, were measured on new product development (NPD). To the success of NPD, both variables resulted to be important factors. The research also proposed that traditional marketing analysis can work better in more docile markets. (Alijumah, Nuseir & Alam 2021)

There are also studies suggesting that one of the characteristics of big data, volume, is not as significant along with variety and velocity of the data. Ghasemaghaei and Calic (2020) assessed the impact of big data on specifically firms' innovation performance and concluded that implementing new innovations successfully, attention should be focused on the processing speed and different types of data being analysed, rather than just collecting a lot of it. Their study also had findings showing that data velocity is more important attribute than data variety and data volume in enhancing performance. (Ghasemaghei & Calic, 2020)

1.1. Aim of the study and research questions

The aim of this study is to shed light on the fact that analysing big data is useful, if not necessary, when measuring and improving performance and using the knowledge of endless data to optimize marketing activities and innovations. This study will be performed as a systematic literature review, with the intention to gather literature and studies about the use of big data in marketing analytics and innovation capability to form a comprehensive picture of the knowledge we hold today regarding the topic. The study will consider historical background of the topic as well as current research, possible debates in the field, theories, and concepts.

The main research question to be examined in this study is the following:

How does the use of big data in marketing analytics have an influence on innovation capability?

Which will be answered using these sub-questions:

How the relation between innovation capability and the use of big data in marketing analytics has been studied?

What are some key findings from studies that examine the relation between these two?

1.2. Research method and structure

A systematic literature review is a research method used to identify, select, and critically evaluate research to answer formulated research question(s). This should respect a clearly outlined plan where the criteria are specified before conducting the review. This research method requires a carefully thought search strategy that focuses on the specific topic to answer the existing research questions.

This study consists of six chapters. After the introduction, the second chapter discusses the theoretical framework. The main concepts, innovation capability and R&D intensity, big data and marketing analytics together with big data analytics capability form the framework of this study. Fourth chapter introduces systematic literature review as a research method and discusses about the completion of this research, including the search criteria used in the research material search, the inclusion and exclusion criteria, the literature screening process, and the processing of the chosen materials. Following fifth chapter describes the key findings of the study. The sixth and last chapter concludes the findings and answers to the research questions and discusses the relevancy, limitations, and recommendations for future research.

1.3. Theoretical framework



Figure 1. Theoretical framework

The theoretical framework of this study is pictured above in Figure 1. The figure shows the individual main concepts that are being scrutinized, that they have in the joint process and the direction that the pieces of information follow to finally form into some sort of innovation. Each concept can not complete the whole process without the others. The route to new innovations, whether it is a product, an enhanced way to manufacture or organizational development, starts with big data, for it being the ingredients that are needed first to mould that vast knowledge into something usable. Second step is forming those irrelevant pieces of information into understandable form using analytics, this acts as a tool to deliver results. Last step is the possible outcome, new innovations, that could not have been designed without the collecting and structuring information necessary.

2. Big data and marketing analytics

This chapter reviews the two important concepts of this study, big data and marketing analytics. Both are first discussed as individual concepts, then further introducing a new concept binding big data and marketing analytics together.

2.1. The three V's

Former Chief Scientist John Mashey was first to use *big data* as a term and referring to analysing and handling large datasets. In 2001, Doug Laney detailed that big data were characterized by three traits, which were volume, velocity, and variety. Big data is mostly defined focusing on the volume of the data in storage. This is an important attribute, but together with the other two attributes they form the three V's of big data. These create a comprehensive definition and at the same time deny the statement that big data is only about the size of the data. (Russom 2011; Kitchin, McArdle 2016)

Despite the definition of big data, regardless of the widespread use the term itself, it still is quite free in its ontological frames and meaning. It is usual for it to be used in a wide selection of data. The term 'Big data' is being treated as a formless entirety with non-existent conceptual clarity. For those who work with vast datasets it is evident that, even though they do have equal traits, they alter at their characteristics and nature. Not all types have volume, variety and velocity and not all defy statistical techniques or make suddenly sense. There are various forms of big data and there has not been any endeavours trying to separate different types and the attributes that define them. Social media is taking up more room in the scenery and research of big data. Influencers and video media enables non-numeric data to be more present in the field. (Kitchin, McArdle 2016; Sheth 2021)

For some time now "big data" has been a trend in business, computer science, information studies and systems and many other fields. While technology continues to develop in an accelerating speed, we are generating an ever-increasing amount of data. (Maltby 2011) Even though big data may have been overhyped, and the focus was capturing and storing the data instead of analysing it, it is a fact that accessibility of big data is producing data-driven decision cultures in organisations, delivering competitive advantage, and improving

financial performance. The success of industry leaders highlights the reality that big data can be leveraged effectively to support marketing decisions. Completely new forms of digital marketing have emerged, for example search engine optimization (SEO) and marketing analytics plays an essential role in these developments. A demand for more powerful metrics and analytical methods is existing that make data-driven marketing operations more efficient. (Wedel, Kannan 2016)

2.2. Marketing analytics

Marketing analytics consists of collection, management, and analysis of data to produce insights into marketing performance, maximize the effectiveness of instruments of marketing control, and optimize firms' return on investment (ROI). The data and tools accessible today are more than enough to give insight needed to improve marketing and advertising performance. Both quantitative and qualitative dimensions of a potential audience can be easily understood. Insights given by the data can be used to personalize user experiences and provide a real value exchange that meets users' needs and expectations. (Hemann, Burbary 2018)

France and Ghose (2019) have suggested, the top three challenges for analytics to be “finding correlations across multiple disparate data sources”, “predicting customer behaviour”, and “predicting product or service sales”. While the last two are explicit marketing objectives, the first includes several applications used in consumer analysis. The existence of vast amounts of marketing data allows involving techniques that help unravel these challenges.

It may be that not enough marketers have the skill sets to analyse the masses of the data available. Several marketers use Google Analytics to track numbers of potential customers without getting any deeper into the data to clearly get the idea why the numbers change from time to time. The key to do something about it is to know why it has changed or not changed. Those who can make managers identify and understand problems and offer solutions utilizing analytics are the ones who verify the actual worth of marketing analytics. (Chaffey, Patron 2012)

Important thing is to make marketing analytics and big data to work in harmony, this enables the modelling analysing and understanding data. As a result of combined use of resources enhances value and is in many ways advantageous. (Cao, Tian & Blankson 2022)

2.3. Big data analytics

Big data analysis (BDA) differs from traditional marketing analytics (TMA), as BDA follows the information flow and analyses huge amounts of data real-time, TMA focuses on improving key performance indicators for enhanced understanding about advertising, pricing, NPD, and customer relationship management. (Xu, 2016).

The fact that BDA is a relatively novel concept has its influence on the availability of research of the use and outcomes. Improved understanding of customers and better engagement are reasons why companies use BDA. Big data, regardless of how it is used, does not have the nature of a solution rather than material to form a solution. There are still major challenges in converting data into something useful for professionals to use in enhancing performance and provide solutions. (Aljumah, Nuseir & Alam, 2021; Laiet al., 2018)

Traditional marketing analytics offer certain reliability that allow organizations to depend on it when searching for solutions to exact challenges. Real-time data present in social media and smartphone application brings uncertainty and this has an impact in customization of knowledge as well as in its correctness. On the contrary, diverse features of BDA, like forecasting, offer benefits in new product development and automated knowledge. (Schoenherr and Speier-Pero, 2015).

3. Big data analytics capability

The use of big data can allow organizations to enable efficient innovations and gain understanding in consumer behaviour and preferences by collecting and processing marketing information. Compared to competitors, organisations that utilize big data, can have a better chance in improving operations and grow their revenue. (Marshall, Mueck, & Shockley, 2015). Calvard (2016) has stated that “Organizational learning through big data can be considered a constant, disruptive blend of abduction, deduction, and induction to identify patterns and link them to potential remedial actions.” There is even uncertainty if the use of big data is bringing positive results (see e.g. Ghasemaghaei, Hassanein, & Turel, 2017; Ghasemaghaei, Ebrahimi, & Hassanein, 2017; Kwon, Lee, & Shin, 2014).

A new term has been brought up in recent literature, big data analytics capability (BDAC), a sustainable new capability, that allows organizations to process the data available to use in beneficial ways. More attention should be paid to the various processes that allow big data and BDAC to add value. BDAC provides a tool to interpret the huge amount of data and lead to higher efficiency in operations and more sustainable performance. It enables chance for more sustainable innovations and organizational development as well as chance to adapt to rapid changes in customer needs and industries. BDAC gives the opportunity to avoid resource and innovation inertia that slows down or prevents possibly beneficial initiatives. These factors indicate, that BDAC may have an important role connecting big data resources and innovation performance. When a positive relationship between these two is created, BDAC enables value extraction from big data and leverages full potential of the available resources. (Hao, Zhang & Song 2019)

4. Innovation capability

This chapter discusses the concept of innovation itself, what innovation capability involves, why it could be important for companies to adopt and finally the measuring of how companies allocate their assets to the prime factor to drive innovation.

4.1. Innovation

Various comprehensions of the term ‘innovation’ can be found in literature. Generally, ‘innovation’ has its origin in the Latin words ‘novus’ for new or ‘innovatio’ for alteration, which is the basis of most definitions. However, multiple perceptions of innovation have evolved over the past decades. As a term, innovation, has been the most overused business term of today. Innovation capability implies that an organization can by itself successfully develop inventions or improvements and commercialize them within (for example, as a new process) or outside (for example, as a new product or service). (Buchmann, Kissel 2010; Krasadakis 2020)

The first instance of an idea being brought to life is referred to as an invention. On the other hand, innovation is the process of commercialization of the idea. This is the case with many different types of innovations, such as those related to biotechnology. While inventions can be carried out anywhere, such as in universities, they usually come from firms in the commercial sector. Inventive firms need to have various kinds of resources, capabilities, and knowledge to turn their inventions into successful ventures. For instance, they need to have the necessary equipment and know-how to produce and market their goods and services. (Fagerberg 2004)

Innovation capability is something necessary for organization to develop to become innovative. They need to acquire and manage innovation capability to survive and succeed in today's challenging and dynamic business environment. Even though the whole scene and usage of big data and its direct influence in innovation performance is still uncertain, innovation capability is crucial factor, that shows the ability to leverage available resources to create something beneficial for performance. (Ghasemaghaei & Calic 2020; Saunila & Ukko 2012)

4.2. R&D Intensity

Research and development (R&D) include systematically completed creative work to expand knowledge and application of this knowledge to develop new functions. Along with basic research, it also contains applied research, and experimental development. The first, basic research, focuses on experimental or theoretical efforts in order to obtain new knowledge on the basis of occurrences and evident realities. Applied research has an addition that its concentrating on a precise point or a practical goal. Experimental development uses existing knowledge that could have been acquired from both, research, and practical experience, and creates enhanced products, services and/or processes. (OECD)

R&D intensity is formed as a ratio of company's investment in R&D to its revenue, as in the percentage of reinvestment in R&D. R&D could be the described to be a prime factor to drive innovation, and R&D intensity and expenditure to be the main attributes to observe and follow capitals that are allocated in science and technology. (Savrul, Incekara 2015)

5. Research approach

5.1. Systematic literature review as a research method

The focus of this study was to find out what knowledge and conducted research we hold today about the relation between big data analytics and innovation capability and gain a comprehensive picture of the findings. The research method was selected to be a systematic literature review as it a reproducible explicit way of recognizing, assessing, and finding relations in current literature and research conducted by scholars and practitioners. The method consists of a process of choosing accurate literature to find research that is beneficial for the review. (Fink 2010, 3)

The method gives the opportunity to abbreviate the centric information of the related topic formed through many different sources and the assess the coherence of conducted research (Salminen 2011, 9; Pettigrew 2001, 99-100). The goal of a systematic literature review is to answer specific research question(s) and it differs from a descriptive literature review by the quality of chosen literature using peer reviews and assessing the quality using different attributes. Fink (2010) states that a systematic literature review has to base on original, high-quality research so that the quality of the review itself can be confirmed.

5.2. Literature search and selection

This study was conducted using the model that Fink (2010) has presented, that consists of seven stages. The first stage is selecting the research question. Precisely stated question forms the basis of the entire review as well as guiding and defining it. Second stage is selecting bibliographic or article databases, sites, and other sources for the literature. A bibliographic database gathers books, articles and further sources that offer information needed to answer previously stated research question. Third stage is choosing the search terms that are used to search literature around the reviews topic(s). The chosen search terms, words and phrases should be based on the research questions frame. Fourth stage applies is the first screening task. Practical screening criteria is applied to the articles produced in the preliminary search. This includes including and excluding criteria using factors such as the

publication date, type of article and the language it is written. Fifth and second screening stage applies methodological criteria, which includes criteria for assessing the scientific quality. Sixth stage is conducting the review. Reviews that are reliable and convincing, have a standardized way of extracting data from the literature and observing the quality of the review. The seventh and last stage is producing the results of the review. The results can be made descriptively, these include possibly limiting attributes as the reviewers' own experience and the overall value of the chosen literature. (Fink 2010, 4–5)

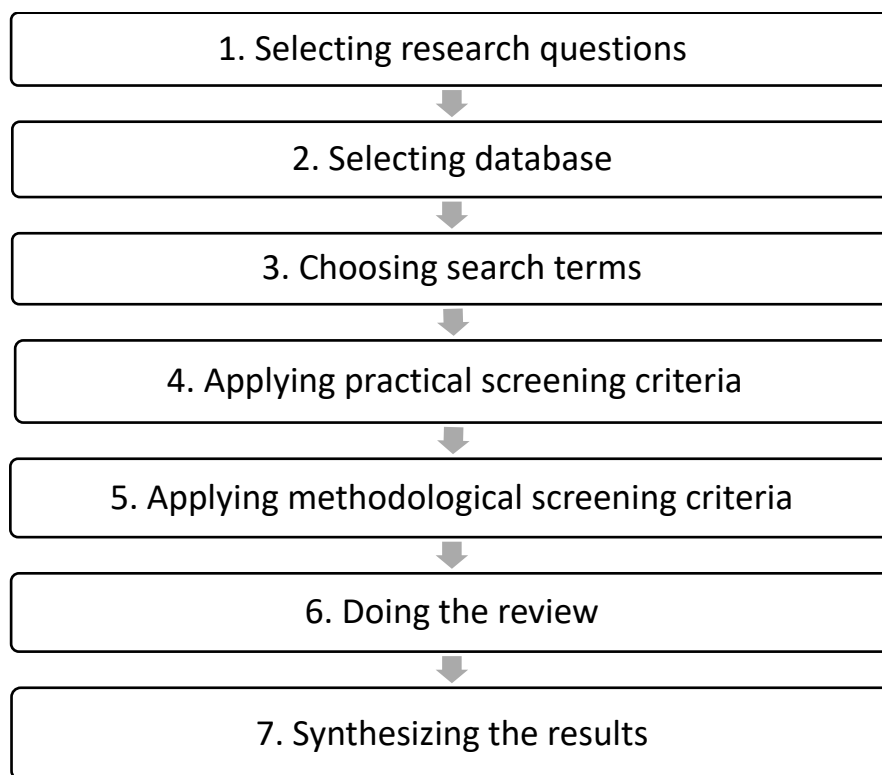


Figure 2. Stages of research based on the Fink (2010) model.

5.2.1. Research question

This study was conducted as a systematic literature review and its aim was to form a comprehensive picture of the knowledge, we hold today regarding the use of big data in marketing analytics and if it has influence on innovation capability. The study will consider historical background of the topic as well as current research, possible debates in the field, theories, concepts, and gaps. The main research question was formed to be:

How does the use of big data in marketing analytics have an influence on innovation capability?

Which will be answered using these sub-questions:

How the relation between innovation capability and the use of big data in marketing analytics has been studied?

What are some key findings from studies that examine the relation between these two?

5.2.2. Database, search terms

To gather a necessary amount of quality literature, Google Scholar and LUT Primo databases were used with search terms listed below. The focus being on research and literature that examine the topics together, search terms included phrases that consist of all topics, as well as two of them together. Because the term “big data” can be written both in uppercase and in lowercase, so both spelling was included in the searches. The asterisk (*) was used to include the conjugated forms of “innovation capability”. The search terms and phrases were formed to be:

- “Big Data” “big data” AND “innovation capabilit*"

5.2.3. Screening criteria

Meticulous research standards are the mark of high-quality studies. Several attributes influence the overall quality of the research including how the data is collected, analysis method and the interpretation of the results, among others. The research design and data sources need to be valid, methods fitting to the features of the study and data used. (Fink 2010)

A search without limitations can produce a massive number of candidates to review. To avoid going through unnecessary articles, that may be irrelevant or poor in quality, some sorting and/or limiting is highly important. Adequate screening process guarantees accuracy of the literature review. Process containing two stages ensures relevant and high-quality

studies to be included into the review. First stage is practical screening that has criteria in language, publication year and inclusion of necessary topics. Second stage considers quality, involves articles that are peer-reviewed and have adequate information to answer research questions of the review. (Fink 2010)

First screening was conducted when choosing to include the literature from the initial search. Screening happened partly as a part of the search when setting limitations and sorting. The search was set to only produce articles written in English. From the results, the articles that included two of the topics in the title and were published after 2010, were included.

The second screening was conducted as an exclusion to the literature included in the first stage and focused on the quality and content. The included articles needed to be peer-reviewed to ensure the scientific standards and quality. After reading the chosen literature so far, the last two exclusion criterion were used to only include articles that discussed relevant matter and were not too specialized to go past the main topic of this review.

Table 1. Inclusion criteria

Criterion	Reason for inclusion
Articles in English	Ensures full comprehension
Newer than 2010	Ensures the latest information
Title includes two topics	Ensures relevant literature for the review

Table 2. Exclusion criteria

Criterion	Reason for exclusion
Not peer-reviewed	Leaves out literature not meeting the scientific standards
Not providing answers to research question	Leaves out irrelevant literature
Specialized context	Leaves out literature too niche to the review

5.2.4. Search and article selection

The initial search from the databases was conducted 15.11.2022. In LUT Primo database, the results were limited to articles and literature that were available online and written in

English. The search gave 52 results overall. Additional literatures were searched from Google Scholar with the same search terms. Because of the vastness of the database, search was sorted by relevance and only the first two pages of search results viewed.

After the search and choosing the 30 most relevant articles and literature according to the inclusion criteria, second screening followed the exclusion criteria. After the second screening, which left out not peer-reviewed literature and the ones with too specialized content or case study, 14 articles were left to review.

5.2.5. Analysing the literature and synthesizing results

Because literature review is a research method that gathers evidence to support or abandon the research hypothesis, the evidence from the literature ought to be valid, understandable, and unbiased. To attain this, the literature that survived the screening process, still need to be analysed and confirm its validity. Validity could depend on the methods used, how the data is gathered, sampled, and analysed. (Fink 2010)

The main feature that can be extracted from literature is how greatly the topic in hand has been studied and how much is currently known. In descriptive reviews, such as this, the writer utilizes their experience and expertise to synthesize the articles, chosen to be in the review, by assessing their possible resemblances and differences. Attributes affecting to the validity of the review are the reviewers experience, critical thinking, and the overall quality of the chosen articles. Statistical techniques may be applied to visualize and summarize the results, statistical techniques in descriptive literature review. (Fink 2010)

The literature remaining after completed screening, were analysed by reading the articles thoroughly to make sure any did not have aspects that would fill the exclusion criteria and to gain broad understanding of the state of the current knowledge held regarding the subjects.

The first and second sub-questions, how the relation between innovation capability and the use of big data in marketing analytics has been studied, and what are some key findings from studies that examine the relation between these two, are answered via the information gathered to the table from the studies and by finding similarities and differences between the reviewed literature.

6. Results

This chapter describes the chosen articles, the variables used and finally the results of each individual study. Overall, 12 articles were eventually chosen for the review. The articles are published between the years 2017-2022, which ensures the recency of the available information. This is in line with what Alijumah et al. (2018) stated, that BDA and research around it is a relatively novel concept. The data used in the studies, was gathered from different countries all over the world and from companies and employees representing different industries.

6.1. Big data and innovation

11 of the total 12 articles had the term ‘big data’ on the title but innovation capability was not such fixed term on majority of them. The different concepts for innovation used, were innovation performance, new product development, new product success, marketing capabilities, process innovation, service supply chain performance, market agility and competitive performance, innovation capabilities, business model innovation, sustainable capabilities. Table below shows the theme and terms used on each study.

Table 3. The writers and variables in each study.

Writers and publication year	Dependent variable	Independent variable
Hao et al. (2019)	sustainability of innovation and organizational development	BDAC
Ghasemaghei & Calic (2020)	innovation performance (innovation efficacy and efficiency)	big data’s attributes
Alijumha et. al (2021)	new product development (NPD) success	big data and TMA
Hajli et. al (2019)	customer agility in new product success	BDA
Cao et. al (2021)	marketing capabilities	big data and TMA
Henao-García et. al (2021)	innovation capability, management innovation	BDAC
Niebel et al. (2017)	product innovations	BDA
Ciampi et al. (2021)	Business Model Innovation (BMI)	BDAC

Singh et al. (2019)	broader firm performance	big data technologies
Mikalef et al. (2019)	two types of innovation capabilities: incremental and radical	BDAC
Ramadan et al. (2020)	sustainable competitive advantage (SCA)	BDAC
Usai et al. (2021)	innovation performance	digital technologies

Hao et al. (2019) conducted an empirical study involving 1109 innovation projects across United States and China that specifically were data-driven. The aim was to investigate how big data and its use affect innovation success and sustainability. They stated that results were surprising and challenging existing views of big data's importance on the matter. Variables used in this study were big data, BDAC, and project performance. According to the results, for both United States and China, big data had a positive linear relationship with sustainability of innovation and organizational development measured by three-year average gross margin. However, the study hypothesized that after the level of big data reaches a critical point, sustainability of innovation and organizational development may decline, which was supported through the results. For the United States service innovation projects, the use of big data had an inverted U-shape relation with sales growth meaning that highest level of sales growth was related to a moderate level of big data and a high level of it had a negative impact on sales growth. The reason for this was suspected to be resource and routine inertia when employees rely too much on the available data to access knowledge and overlooking other resources to allocate necessary for sales growth and innovation success. (Hao et al. 2019)

Ghasemaghaei and Calic (2020) researched the three different main characteristics of big data (variety, volume, and velocity) individually trying to find out if they all contribute to enhance innovation performance. The study collected data from 239 middle- and top-level managers to answer the three hypothesis' that all three characteristics will increase innovation performance. Results indicate that organisation's ability to utilize big data is a crucial source of innovation. However, according to the results, data variety and velocity have a significant positive affect on innovation efficacy and efficiency, while volume of the data does not have a significant impact. Meaning that while firms need to focus on different type of real time data, that bigger is not always better, as large amounts tend to have irrelevancies and may burden the data analysing without any significant use. Study also

suggests that the main characteristics can have different effects on the outcomes and thus they need to be differentiated rather than thinking big data as a holistic concept. (Ghasemaghaei and Calic 2020)

Alijumha et. al (2021) had their focus on new product success and how traditional marketing analytics and big data analytics have an affect on it. Data used was based on a survey sent in the spring of 2020 to manufacture companies in United Arab Emirates. The survey gathered 327 usable answers which were analysed using SEM-PLS technique. Results show that companies have a reason to combine traditional marketing analytics and big data analytics to succeed in the market and focus on big data system quality, as these are significant determinants of new product development success. Big data gives organisations the chance to gain competitive advantage through knowledge and the possibility to identify needs of their consumers. (Alijumha et. al 2021)

The study conducted by Hajli et al. (2019) also examined new product success and the impact big data has on it. The study was conducted as a qualitative case study, using cases from Finland, Canada, and United Kingdom. The study agrees with the one above in many ways and suggests that the effective use of data aggregation and analysis tools result in customer agility, which indicates how organizations responds to innovation opportunities. (Hajli et al. 2019)

Cao et al. (2022) focused their study to investigate how the use of big data can enhance the firms marketing capabilities, which affects marketing planning and implementation, brand management and customer relationship management, and product development management. Data was gathered from Chinese firms from different industries, via a survey which provided 316 usable answers, and more than 85% of the respondents were marketing managers. The study offers evidence on how the use of big data and marketing analytics enhance marketing capabilities indicating that investing in these resources and utilizing the information gained from big data, marketing capabilities can be improved and developed. (Cao et al. 2022)

Heneo-García et al. (2021) investigated the connection between, process innovation capability, management innovation and big data analytics capability, focusing on how companies can maximize their investments in big data. Data for this study was gathered by sending a questionnaire for administrative staff of 600 Colombian firms that work in a

regional innovation program. This survey yielded 195 usable answers. Findings underline the importance of innovative managers, promoting innovative processes and who are in favour of developing capabilities in big data analytics. Findings also suggest that because big data can have a subjective nature, leading to biases, BDAC is necessary but not sufficient on its own to gain better performance. (Heneo-García et al. 2021)

Niebel et al. (2017) conducted a study focusing on the connection of the use of big data analytics to companies' innovative performance, specifically product innovations. The data used was collected from 2706 German companies from manufacturing and service industry. Findings of this study suggest that the use of BDA relates to higher tendency to innovate and higher innovation intensity, which was measured using sales shares of a new product or a service. The study also provided evidence that the effect was similar with both, manufacturing, and service industry. Lastly the findings suggest that the use of big data and its benefits to innovation performance are depended on the investments in specifically IT-skills rather than general human capital. (Niebel et al. 2017)

Another form of innovation, Business Model Innovation, and its relationship to BDAC was investigated in a study by Ciampi et al (2021). There is no previous empirical work done investigating the connection between big data analytics on Business Model Innovation, so this study has a profound contribution to literature. Business Model has been divided into three aspects which are value creation, value proposition and value capture. Data for this study was gathered from 253 valid responses from UK companies from different industries. Findings show a direct and a positive connection between BDAC and Business Model Innovation. Findings suggest that in order to develop Business Models, companies have to value BDAC by recruiting and training capable employees, applying organisational learning and knowledge sharing practises. (Ciampi et al. 2021)

Singh et al. (2019) investigate the effects of integrating big data technologies to sustainable capabilities, both organizational and environmental. Data was gathered from 215 employees across Kingdom of Saudi Arabia, the United Arab Emirates, Egypt, and Lebanon. Regarding the use of big data, study findings suggest that the integration of big data technologies in strategic and operational activities attains sustainable performance. Findings show that corporate commitment affects the integration of big data across acceptance and routine, which enhances sustainable performance. (Singh et al. 2019)

Mikalef et al. (2019) have their focus on two types of innovation in their study: incremental and radical and examine the relationship of BDAC to them and extends already existing literature by suggesting that BDAC allows companies to fortify their dynamic capabilities, which affect incremental and radical innovation capabilities. Data was gathered from 175 Greek companies. Finding of this study show that BDAC can lead to improved incremental and radical innovation capabilities by affecting companies' dynamic capabilities. Results underline the importance of recruiting employees who understand big data analytics technically and managerially and valuing organizational learning to gain business value out of big data. (Mikalef et al. 2019)

Ramadan et al. (2020) conducted a study with the aim to find out whether BDAC can improve innovation capabilities and further advantage sustainable competitive advantage (SCA). This study was the first to examine the effect of data availability on BDAC and provides evidence that an increase in data availability has a positive impact on BDAC, however Iot holds an important role in this as if data availability is not backed with it, BDAC will not improve. The study also provides evidence that BDAC impacts positively on innovation capability and that impacts positively on SCA, suggesting that companies who lack BDAC variables, also have reduced abilities to adjust rapidly in technologies and changes in the market. This study only gathered data from manufacturing companies and the examiners stated that the sample size needed to be increased to be able to provide more accurate results. (Ramadan et. al 2020)

While other studies of this review relatively support each other, Usai et al. (2021) had a different point of view in theirs. They examined if the increased use of digital technologies has a positive impact on innovation performance and argue that the technologies have low impact on it. Data for this study, was gathered from Eurostat, and it included ICT usage information in European companies and their innovation performance. The findings surprisingly support the arguments. Results show that the adoption of high-tech digital technologies does not result in a direct and linear relationship with innovation performance. This does improve companies' efficiency but are not the reason for competitive advantage, as the source of competitive advantage is companies' unique knowledge, according to this study. However, the findings show that the digital technologies that hold the most value regarding innovation are 3d, robotics and big data analysis. Study suggests that investments in research and development hold the most value in radical innovations and that digital

technologies are not sufficient to replace creativity, intuition, and intellectual capital. (Usai et al. 2021)

7. Discussion and conclusions

The aim of this study was to discover if and how big data can be a useful, if not necessary, tool when measuring and improving capability and using the knowledge of endless data to optimize marketing activities and innovations. The aim of the study and research questions were discussed first followed by a theoretical framework to visualize the relationship between big data, marketing analytics and innovation capability. Each concept was individually discussed to give the reader a clear understanding of the terms and theories used in this review. The research method was then described more detailed along with the exact process of selecting the literature for this review.

This study was performed as a systematic literature review, with the intention to gather literature and studies about the use of big data in marketing analytics and innovation capability to form a comprehensive picture of the knowledge we hold today regarding the topic.

5 of the chosen studies examined BDAC, 1 differentiated the three attributes of big data and examined them as individuals and their relationship with innovation performance, 2 of the studies also considered TMA along with big data and 2 discussed BDA, 1 examined big data technologies broader and 1 had their interest in digital technologies. The different concepts of innovations examined were innovation performance, new product development, new product success, marketing capabilities, market agility and competitive performance, innovation capabilities, business model innovation, sustainable competitive advantages.

All the studies that were reviewed were relatively new which, as stated previously, is in line with what Alijumah et al. (2018) stated, that BDA and research around it is a relatively novel concept. The multiple concepts of the use of big data complicates the concluding of this review however it offers some versatility to the research. Innovation capability can also be relatively vague concept and some studies have more niche point of view than others.

Conclusion 1: The relation between innovation capability and the use of big data in marketing analytics has been studied in an accelerating speed and the existing research is moderately new.

Conclusion 2: The research studying the relation between innovation capability and the use of big data in marketing analytics are prone to have focus in big data analytics capabilities.

According to the findings, combining traditional marketing analytics and big data can be highly useful and provide benefits and that investing in these improves new product success and marketing capabilities (Alijumha et. al 2021; Cao et al. 2022). Niebel et al. (2017) suggested that the use of BDA has a positive relation to higher innovation intensity, measured by new product success.

When studying sustainable innovations, results show that the use of big data, in a moderate level, enables companies to attain sustainable innovation performance and BDAC has an impact on innovation capability which impacts sustainable competitive advantage (Hao et al. 2019; Singh et al. 2019; Ramadan et. al 2020)

When the three attributes were examined individually, the results show that the velocity and variety of data were far more significant regarding innovation efficacy and efficiency, and the volume of the data was more insignificant. (Ghasemaghaei and Calic 2020)

One aspect was brought up in multiple findings, in addition to the fact that big data and analytics around it has a direct and a positive impact on innovation performance (Niebel et al. 2017; Ciampi et al. 2021) is that in order to gain the maximal benefit from the use of BDAC, companies need to recruit and train skilled professionals who understand IT and big data, invest in organizational learning and make sure that managers are innovative and support the technologies that enable new developed products and processes. (Mikalef et al. 2019; Ciampi et al. 2021; Heneo-García et al. 2021)

One study in this review was not in line with others and suggested that digital technologies do not have a positive impact on innovation capability, however when examining different technologies, Usai et al. (2021) stated that big data was one of those, which had the most value regarding innovations.

Conclusion 1: The moderate and correct use of big data is beneficial for innovation capability.

Conclusion 2: The optimal usage and benefits of big data require skilled employees and a culture of organizational learning.

To tie together the results, the positive and negative, table below shows major findings in each column that were not specifically answered with the research questions.

Table 4. Results in positive and negative.

Pro's	Con's
Velocity and variety better than volume	Moderate use offers benefits, employees stay creative
Investing in BDA and TMA improves NPS	Digital technologies may be overrated, however big data the most useful
Helps attaining sustainable innovation	Requires constant training and improvement of skills

The key findings that could be implied as positive are that from the different attributes of big data, velocity and variety of data is more important than the volume of it. Results show that investing in both big data analytics and traditional marketing can improve new product success and that the use of big data has impact on achieving sustainable innovation.

According to the results, the use of big data is not all positive and suggest that there can be limiting factors to it. Results show that the use of big data is beneficial, to a certain point, because relying too much in automated marketing and analytics could create routine inertia, possibly preventing potential initiatives. Some of the excitement and expected benefits from digital technologies are suggested to be overrated, nevertheless big data was shown to be the most useful regarding innovations. And as stated in the conclusion, in order to take benefit of the use of big data, employees should be constantly trained, and tools improved to keep up with the rapidly changing industry.

The detailed and thorough description of the review process was to ensure transparency and reproducibility of this study. The limitations of this study are related to the research method and the researcher's application of it. The literature was mainly searched from two databases, which limits the possible results. The search terms were carefully chosen keeping the goals of the study in mind; however, their choice may have additionally limited the literature search's results. The relatively small number of studies under review and the limitations of the studies have also contributed to the limitations of this study. In the inclusion and exclusion of studies and in the evaluation and reporting of results, the researcher's own subjective evaluation ability may have brought its own limitations to this study.

Suggestions for future literature reviews around this topic, it would be beneficial to use multiple or different databases and include more literature to attain more versatile studies and more reliable results.

References

Aljumah, A.I., Nuseir, M.T. and Alam, M.M. (2021), "Traditional marketing analytics, big data analytics and big data system quality and the success of new product development", *Business process management journal*, Vol. 27, No. 4, pp. 1108-1125.

Buchmann, J. and Kissel, F. (2010), *Innovation Capability Due Diligence: Investigating the Innovation Capability of Companies*, 1st ed., Routledge.

Cao, G., Tian, N. and Blankson, C. (2022), "Big data, marketing analytics, and firm marketing capabilities", *Journal of Computer Information Systems*, Vol. 62, No. 3, pp. 442-451.

Chaffey, D. and Patron, M. (2012), "From web analytics to digital marketing optimization: Increasing the commercial value of digital analytics", *Journal of Direct, Data and Digital Marketing Practice*, Vol. 14, No. 1, pp. 30-45.

Ciampi, F., Demi, S., Magrini, A., Marzi, G. and Papa, A. (2021), "Exploring the impact of big data analytics capabilities on business model innovation: The mediating role of entrepreneurial orientation", *Journal of business research*, Vol. 123, pp. 1-13.

Davis, B., Grewal, D., and Hamilton, S. (2021). *The Future of Marketing Analytics and Public Policy*. *Journal of Public Policy & Marketing*, Vol. 40, No. 4, pp. 447–452.

Erevelles, S., Fukawa, N. and Swayne, L. (2016), "Big data consumer analytics and the transformation of marketing", *Journal of business research*, Vol. 69, No. 2, pp. 897-904.

Fagerberg, J. (2004), "Innovation: A guide to the literature". Available at: https://smartech.gatech.edu/bitstream/handle/1853/43180/JanFagerberg_1.pdf?sequ

France, S.L. and Ghose, S. (2019), "Marketing analytics: Methods, practice, implementation, and links to other fields", *Expert Systems with Applications*, Vol. 119, pp. 456-475.

Ghasemaghaei, M. and Calic, G. (2020), "Assessing the impact of big data on firm innovation performance: Big data is not always better data", *Journal of business research*, Vol. 108, pp. 147-162.

Hajli, N., Tajvidi, M., Gbadamosi, A. and Nadeem, W. (2020), "Understanding market agility for new product success with big data analytics", *Industrial marketing management*, Vol. 86, pp. 135-143.

Hao, S., Zhang, H. and Song, M. (2019), "Big data, Big data Analytics Capability, and Sustainable Innovation Performance", *Sustainability (Basel, Switzerland)*, Vol. 11, No. 24, pp. 7145.

Hemann, C. and Burbary, K. (2018), *Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World*.

Henao-García, E., Arias-Pérez, J. and Lozada, N. (2021), "Fostering big data analytics capability through process innovation: Is management innovation the missing link?", *Business information review*, Vol. 38, No. 1, pp. 28-39.

Iacobucci, D., Petrescu, M., Krishen, A. and Bendixen, M. (2019), "The state of marketing analytics in research and practice", *Journal of Marketing Analytics*, Vol. 7, No. 3, pp. 152-181.

Kitchin, R. and McArdle, G. (2016), "What makes Big data, Big data? Exploring the ontological characteristics of 26 datasets", *Big data & Society*, Vol. 3, No. 1, pp. 1.

Maltby, D. (2011), "Big data analytics", "Big data analytics", 74th Annual Meeting of the Association for Information Science and Technology (ASIST), pp. 1.

Mikalef, P., Boura, M., Lekakos, G. and Krogstie, J. (2019), "Big data Analytics Capabilities and Innovation: The Mediating Role of Dynamic Capabilities and Moderating Effect of the Environment", *British Journal of Management*, Vol. 30, No. 2, pp. 272-298.

Nichols, W. (2013), "Advertising Analytics 2.0", *Harvard business review*, Vol. 91, No. 3, pp. 60-68.

Niebel, T., Rasel, F. and Viete, S. (2019), "Big data–BIG gains? Understanding the link between big data analytics and innovation", *Economics of Innovation and New Technology*, Vol. 28, No. 3, pp. 296-316.

OECD. "Research and Development (R&D) - Gross Domestic Spending on R&D - OECD Data." TheOECD, 2020, Available at: data.oecd.org/rd/gross-domestic-spending-on-r-d.htm. Accessed 15 Oct. 2022.

Petrescu, M., Krishen, A. and Bui, M. (2020), "The internet of everything: implications of marketing analytics from a consumer policy perspective", *Journal of Consumer Marketing*.

Ramadan, M., Shuqo, H., Qtaishat, L., Asmar, H. and Salah, B. (2020), "Sustainable Competitive Advantage Driven by Big data Analytics and Innovation", *Applied sciences*, Vol. 10, No. 19, pp. 6784.

Russom, P. (2011), "Big data analytics", *TDWI best practices report, fourth quarter*, Vol. 19, No. 4, pp. 1-34.

Sathi, A. (2017), *Engaging customers using big data: how marketing analytics are transforming business*, Springer.

Saunila, Minna and Ukko, Juhani. (2012). "A conceptual framework for the measurement of innovation capability and its effects. *Baltic Journal of Management.*" Vol 7, pp. 355-375.

Savrul, M. and Incekara, A. (2015), "The effect of R&D intensity on innovation performance: A country level evaluation", *Procedia-Social and Behavioral Sciences*, Vol. 210, pp. 388-396.

Sheth, J. (2021), "New areas of research in marketing strategy, consumer behavior, and marketing analytics: the future is bright", *Journal of Marketing Theory and Practice*, Vol. 29, No. 1, pp. 3-12.

Singh, S.K. and El-Kassar, A. (2019), "Role of big data analytics in developing sustainable capabilities", *Journal of Cleaner Production*, Vol. 213, pp. 1264-1273.

Usai, A., Fiano, F., Messeni Petruzzelli, A., Paoloni, P., Farina Briamonte, M. and Orlando, B. (2021), "Unveiling the impact of the adoption of digital technologies on firms' innovation performance", *Journal of business research*, Vol. 133, pp. 327-336.

Wedel, M. and Kannan, P.K. (2016), "Marketing analytics for data-rich environments", *Journal of Marketing*, Vol. 80, No. 6, pp. 97-121.