

Features of Big Data approach and new opportunities of BI-systems in marketing activities

Igor Ilin¹, Anastasii Klimin¹, and Anton Shaban^{1,*}

¹Peter the Great St.Petersburg Polytechnic University, Polytechnicheskaya, 29, St. Petersburg, 195251, Russia

Abstract. At the moment, the conditions of fierce competition in production and sales bring the role of marketing in business to the fore. Big data, which form the basis of BI-systems, and which arise as a result of digitization of economic and any other activity, are growing exponentially. To better understand the impact of Big Data on various marketing activities, it is necessary to consider the main aspects of Big Data approach. A description of the situation on the Big Data market was given, problems were posed, and ways to study them were described. The article describes the possible ways of classifying Big Data, the types of data that are used. Eventually, this article reveals features of Big Data approach and new opportunities of BI-systems in marketing activities. In conclusion, the problems of the study were reviewed, and the main guidelines for future research on the topic were given.

1 Introduction

In 2017, global income on the market of Big Data and business analytics market was supposed to reach \$150.8 billion, which is 12.4% more than last year (2016). Globally, the Russian market for Big Data services and technologies is still very small. In 2014, the American company International Data Corporation (IDC) estimated it at \$ 340 million [1]. As of 2018, the Russian market has not changed much and amounted to \$355 million, which is approximately P22 billion [2].

In 2019, we talk that Big Data analytics is becoming one of the most popular tasks in modern business. The data differs: according to Frost & Sullivan, in 2021, the total volume of the global analytics market for big data will increase by more than 2.5 times compared to 2016 and reach \$ 67.2 billion, with an annual growth rate (CAGR) of 35 ,9%. In this case, the largest market segments will be the manufacturing sector, finance, health care, environmental protection (EP) and retail trade [3].

Big data analytics (BDA) includes the analysis of large, complex, and often unstructured data sets, allowing you to identify valuable information, accurately determine trends, predict production performance and optimize costs. In the manufacturing segment and other industrial sectors, analysts record an increased demand for BDA: an increase in investment in big data analytics here is due to the need to increase enterprise productivity and optimize resources.

It is important to note that IDC specialists divide the market of Big Data software solutions and analytics into the following segments:

- performance management and analysis applications;

* Corresponding author: 14371759@kafedrapik.ru

- business intelligence and analytical tools;
- software for data analysis management and platform integration.

By 2025, the scope and number of projects implementing big data analytics will also increase significantly. In particular, the BDA will be used in such areas as real-time risk management, blockchain analytics and remote monitoring of analyzed objects.

The influence of various industries on the big data analytics market has been attempted to measure by Frost & Sullivan Company [3]. It is clearly seen that the highest rating is inherent in companies that operate in the ICT, financial sector and trade (see Fig.1).

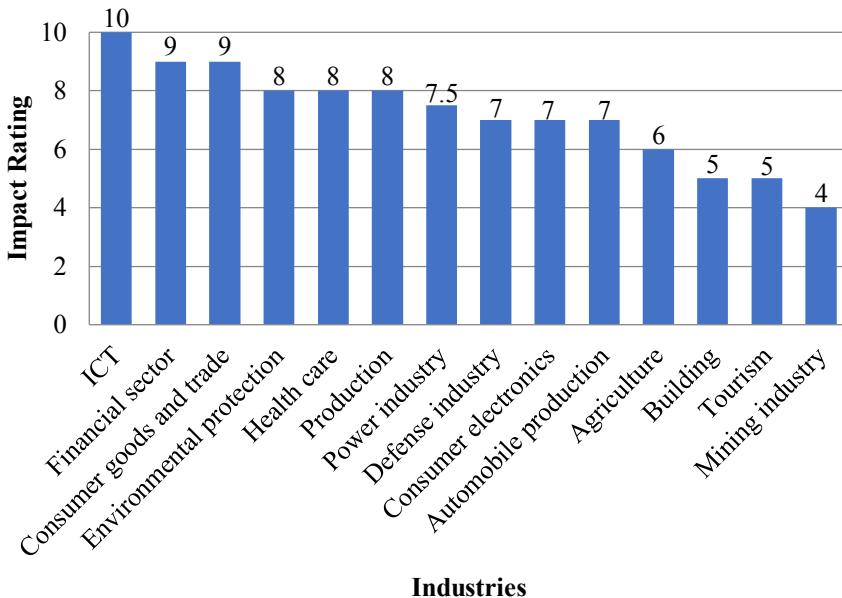


Fig. 1.The impact of various industries on the Big Data analytics market.

Nowadays, the Big Data approach is increasingly penetrating into various areas of business and our life. First of all, it is connected with the global digitalization of the economy, the growth of automation, the improvement of interfaces for human and computer interaction, the increase in the number of digital platforms [4; 5; 6].

The main trend in the development of Big Data is the transfer of the Big Data infrastructure to cloud hosting and stream analytics, which allows analyzing the incoming data in real time [7]. Now the BD approach is most widely used in the service sector, and the source of BD in this case is not the machines and mechanisms, but the people themselves [8].

As we already know, trading is one of the most attractive segments for analytics usage. There is also a clear tendency to move from classical marketing to digital, where operational and strategic steps are taken often on the basis of the information collected and analyzed [9]. Accordingly, marketing is fertile ground for the use of BDA and BI-systems.

1.1 The object and the subject of the study

The object of the research is the marketing activities of enterprises. The subject of research is the analysis of BI-systems, as a system of effective management of the marketing activities of the enterprise.

1.2 Theoretical foundation

Analysis of scientific, educational, periodic, methodical, reference books, as well as regulatory documents and electronic sources showed that the problem of a large amount of data and the introduction of BI-systems for the effective management of a marketing enterprise is poorly understood. Studies of BI-systems are presented in the works of such Russian and foreign authors as: Belyansky V., Miloradov K., Ponomarev S. V., Naumova V. N., Kondratieva V. V., Kuznetsov M. N., Ekkerson U. W., S. Erevelles, N. Fukawa, L. Swayne, H. Chen, R.H.L. Chiang, V.C. Storey [10]. In general, all authors consider and describe specific cases of the application of the approach and the system in different areas. Now there is no one generally accepted classification of big data, as this is a relatively new concept.

The theoretical basis of this article is the research of Russian and foreign experts in the field of marketing fundamentals, digital marketing, BI systems and the Big Data approach used in them (and other areas). The following research methods are used in the work: classification, comparison, analysis, systematization, generalization.

1.3 The main problems to study

The main problems that are explored in this article are:

- the problem of applicability of the Big Data approach in marketing activities: it is necessary to investigate what types of data can be used, how to use them, what information can be obtained from them, what software products are used at the moment, understand what aspects of marketing can affect the Big Data storage and analysis approach;
- the problem of the expediency of using BI-systems in marketing activities, analysis of the opportunities provided by such systems and analysis of the benefits gained from implementation. In addition, the study of sources on the topic showed that the problem of a large amount of data and the introduction of BI-systems for the effective management of the marketing activities of the enterprise is poorly understood.

2 The main part of the study

2.1 Theoretical aspects of the Big Data approach

Big data is a term used to refer to data sets that are too large or complex for traditional data-processing application software to adequately deal with. Big data challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy and data source. Big data was originally associated with three key concepts: volume, variety, and velocity [11].

Information is the main aspect of successful growth forecasting and marketing strategy. Big data analysis has long been used to determine indicators such as: target audience, interests, demand, consumer activity [12]. Thus, Big Data is one of the most accurate marketer's tools for forecasting. The main impact that BD can have in marketing is the ability to target advertising and commercial offers for specific people using their "digital footprint".

Digital footprint (or digital fingerprint, sometimes referred to as digital or cyber-shadow) is the entire amount of information about visits and user actions during their stay in the digital space. It may include data from the Internet, mobile Internet, web space, and telecommunications networks.

Digital footprint creates a database and facts related to finding someone in the digital environment. These can be social network profiles, information about visited web pages, files stored on the network, personal messages, comments, videos, photos and any other information that has been uploaded to the Internet and vice versa downloaded from the network, including input personal data of the user. Sometimes such materials can be publicly available, most often part of the material is confidential.

Due to the fact that some data may be confidential, there is a need to ensure the security of the collected data. Often at the state level the focus is on the legislative basis. For example, in Russia a law on Big Data is being developed [13].

Back in 2012, data-scientists of Target faced a serious challenge [14]. As soon as a woman gives birth, this event becomes the public domain. Advertisers record this moment and immediately offer her to buy everything they need, whether it be a stroller, diapers or baby clothes. But what if you can target her before the baby is born?

Using data on consumer habits of their consumers, Target found that in most cases women who buy a lot of odorless lotion, cotton napkins and terry towels from them, are preparing to become mom. If they manage to induce such a client to buy before the baby is born, she will most likely use their services for many years. By the way, in one of the cases, the teenage girl received by mail a catalog with baby cots and bibs from Target, without even having time to report the pregnancy to her father. This caused quite a big scandal, and information about how to target the audience became public.

7 years have passed since then, a large number of social networks, new types of information about customers and the like have appeared. Further we will try to consider in more detail new opportunities of data analytics in marketing.

2.2 Data requirements and sources of Big Data in marketing activities

Big data can be described by the following characteristics [15]:

Volume. The quantity of generated and stored data. The size of the data determines the value and potential insight, and whether it can be considered big data or not.

Variety. The type and nature of the data. This helps people who analyze it to effectively use the resulting insight. Big data draws from text, images, audio, video; plus it completes missing pieces through data fusion.

Velocity. In this context, the speed at which the data is generated and processed to meet the demands and challenges that lie in the path of growth and development. Big data is often available in real-time. Compared to small data, big data are produced more continually. Two kinds of velocity related to Big Data are the frequency of generation and the frequency of handling, recording, and publishing [16].

Veracity. It is the extended definition for big data, which refers to the data quality and the data value. The data quality of captured data can vary greatly, affecting the accurate analysis.

Since Big Data is difficult to structure, classical characteristics and classification are best for them.

Data must be processed with advanced tools (analytics and algorithms) to reveal meaningful information. For example, to manage a factory one must consider both visible and invisible issues with various components. Information generation algorithms must detect and address invisible issues such as machine degradation, component wear, etc. on the factory floor.

Consider what are the main sources of Big Data in marketing and advertising. First of all, these are user accounts in social networks, email user accounts, registration data on websites, registration data of instant messengers, data of mobile operators, geolocation data

of mobile devices, CRM data of organizations, as well as data from production processes taken from sensors in including messages between machines (M2M, IoT).

Thanks to the collected amount of data and their analysis, it is possible to display advertising (based on the RTB-auction model - Real Time Bidding) only to those consumers who are interested in the product or service.

If we consider retail trade as a separate type of marketing, then on the databases of retail stores a lot of information about customers, the inventory management system, the supply of marketable products can be accumulated. This information can be useful in all areas of the stores.

So, with the help of accumulated information, you can not only improve marketing activities, but also manage the supply of goods, its storage and sale. Based on the accumulated information, it is possible to predict the demand and supply of goods. Also, the data processing and analysis system can solve other problems of the retailer, for example, to optimize costs or prepare reports.

2.3 Big Data Application in Marketing, Software Capabilities Overview

The main players supplying data on the Russian market are: providers of big data and advertising services - search engines GOOGLE, YANDEX; social networks Facebook and Instagram, VK.com, Odnoklassniki (Mail.Ru); Technology and software vendors: Google: Google.Search, Google.AdWords, Google.Analytics (Google's big data processing base is the Google File System (GFS) distributed file system); SAP: HYBRIS, HANA [17]; MICROSOFT: Cortana Intelligence Suite. Dynamics CRM, Azure, SQL; Yandex: Yandex.Search, Yandex.Direct, Yandex.Metrica.

Consider some software products and technologies used to analyze Big Data in more detail.

In marketing, SAP Hybris provides a number of unique services. For example, using dynamic consumer profiles, Hybris tracks the latest actions of people from the company's client base on the Internet and social networks, can recognize their desires and brand opinions using in-memory and BigData technologies. For Hybris, collaboration with Facebook is a significant advantage. Thanks to this, Facebook ads are personalized content tailored specifically for the user, compatible with his preferences and latest actions. Consequently, a deep understanding of their target audience and each client arises, and enterprises have a chance to create unique commercial offers for each of them. With the ability to interact with the client in real time, the company can create email-based newsletters on the basis of knowledge about the past purchases of the client and the unique situation of today.

Google.trends service very accurately indicates the forecasts of seasonal activity of demand for a specific product, fluctuations and geography of clicks. Using such forecasts, it is enough to compare this information with the statistical data of the company's website and you can create a qualitative plan for the distribution of the advertising budget with an indication of time and region.

It should be noted that at the moment Internet advertising in Russia is growing with a growth rate of about 23% per year. The above trends, products, IT services can make it more efficient.

2.4 Theoretical aspects of BI-systems

First of all, when developing a problem, it is necessary to determine the terminology and find out what is BI. BI (Business Intelligence) is, first of all, methods and tools for

translating raw information into a meaningful, convenient form. Further, on the basis of the data obtained, a business analysis is made and strategic decisions are made.

As mentioned above, the basis for creating a BI-system based on the concept of Big Data. Big Data, at the moment, is a key prerequisite for the development of information technology.

To understand BI, Big Data sources in marketing and advertising have been discussed above. Often, data arrays have very large volumes and, in such a situation, the ability to quickly process data and make operational decisions are the most important competitive advantages. Such competitive advantages can provide development in recent years.

In addition, it should be noted that now analytics in marketing occupies one of the leading places. Despite the information progress of the society, a wide range of software analytics tools, there is a question of choosing the best marketing software to carry out convenient data analysis. What does BI include? These are often marketing planning programs that satisfy the analytical needs of the marketing department (from senior managers to ordinary employees). With BI systems, any marketing department can build complex customer profiles, identify unique customer segments, analyze key campaign indicators and, therefore, conduct more effective marketing campaigns. In addition, BI-systems help to support the customer's life cycle from engaging the client to developing relationships and keeping it [18].

2.5 Errors of the introduction of BI-systems

In order to avoid typical mistakes in the implementation of BI systems, it is necessary to clearly describe the goals and objectives that the system should solve. Strictly defining goals and objectives helps choose the tools to solve them and provides insight from end users. Also, it is necessary to think over and evaluate the scale of system implementation in the organization.

It is true that prior to the start of the project, it should be determined what benefits the introduction of the BI system will bring to the business. Often, the introduction of Business Intelligence is due to increasing competition and the need to respond to market challenges (which is important for marketing activities). It is necessary that the BI-project was initiated and supported by business users, and not imposed by IT professionals, as one of the steps to develop corporate information infrastructure [19].

2.6 New features of BI systems in marketing

In this study, I came to the conclusion that it is necessary to answer the question: "What can BI systems do to increase the effectiveness of marketing activities, apart from analyzing data?". Let us consider in more detail what actual opportunities are given by the introduction of a BI system in the marketing service of an enterprise.

First of all, BI-systems include marketing planning programs, which increases the effectiveness of marketing campaigns by: building complex customer profiles by integrating data from a variety of operational and marketing sources and applications, developing a unique message for a specific consumer segment defined by the system, predicting marketing scenarios, which are based on predictive analytics.

Also, as a key opportunity for BI-systems of recent years, we can single out the following advantage for the head of the marketing department: the ability to provide a comprehensive look at the advertising campaign and the organization's marketing activities, which is realized through the analysis of key indicators, performance tracking, the possibility of deepening into aspects of segmentation and targeting (a clearer view of

the audience), deep penetration into the company's marketing business processes, opportunities strategic planning, based on the system data.

It should be noted that the implemented BI system is most effective when it combines data obtained from the market (where the organization operates) with data from sources within the company (internal data). In combination, external and internal data provide a complete picture of the business, which in turn can create a quick understanding that cannot be obtained from just a data set [20].

That is why the main opportunity for the development of BI-systems in marketing activity is the search for new combinations of data (internal with external) and new sources of information, as well as the development of new powerful analytical tools applied to this data for extracting insights from them.

As a trend of recent years and new sources of information used Big data collected from social networks. The possibility of conducting semantic analysis based on the processing of tens of millions of user messages every day was called Social Intelligence. The technology underlying it allows you to extract information from the vast amounts of data that helps companies identify customers' attitudes and preferences, and automatically determines emerging trends and current topics on the basis of which companies can quickly make the necessary decisions [21].

It is fair to say that new capabilities of BI-systems rest not only against new analytics capabilities, but also new functionality that was not available several years ago. BI-systems allow you to grasp new business opportunities and avoid risks with unsurpassed speed and flexibility using interactive dashboards, visualizations, predictive and event analytics on any device, which any other marketing program cannot boast. For example, visualizations (including custom ones) easily help to create a picture of the market or the course of an advertising campaign, which can facilitate communication between the division teams.

Now BI systems have access to the following types of marketing analysis, such as the wallet modeling method and attribute analysis.

Also, the possibility of easy-to-manage business modeling allows for complex analytics, even for an unprepared user.

At the moment, such complex marketing tools have appeared in BI systems as: lead management analytics and the possibility of optimizing sales / discounts based on segmentation, calculating propensity to buy and analyzing purchase patterns to concentrate discount offers on the right prospects at the right time.

3 Discussion and conclusion

Based on the analyzed information, the following conclusions can be made: Big Data for marketing is now an integral part, as in the conditions of the constantly growing market of advertising and information noise, it allows to influence consumers more effectively. Summarizing, we can single out the following points, the substantial transformation of which becomes possible due to the introduction of Big Data technologies. First of all, these are: customized advertising and commercial proposals aimed at a specific consumer in accordance with his interests (social networks, search queries), the ability to create a digital twin of the consumer to predict his behavior, tracking the client's response to products in real time, building a relationship strategy with transformation, and more effective influence in SEO, Email and mobile marketing. However, it should be mentioned that the Russian market has some barriers that must be fought. In particular, these are: difficulties in finding qualified specialists, a small number of cases and insufficient practice in the field of accumulation and analysis of Big Data.

Based on the study, conclusions were made for BI systems in marketing: the development of BI systems in marketing activity is not static and is carried out primarily

due to the possibility of analyzing and identifying correlations between new types of data that were not previously used in the analysis. Also, the new Business Intelligence functionality allows for data analysis and implementation of operational and strategic solutions with high speed. Such opportunities are realized by increasing the productivity of software, including new complex types of data analysis and the possibility of integrating systems with mobile and other devices. However, it is impossible to ignore the fact that BI systems are nevertheless a complex, complex and effective marketing tool and, when they are introduced, it is necessary to have clear ideas and be guided by the goals for which this introduction occurs in order to avoid undesirable consequences.

It is important to note that the study conducted is more aimed at reviewing and identifying new features of BI systems in recent years. The following points can be singled out as weak points and questions for further work on the topic:

- The article failed to systematize big data for marketing, primarily due to the fact that different companies use different data.

- In addition, if the same data set is used, the usefulness of analyzing such data occurs when linking various factors and identifying correlations. It is necessary to find new combinations of information sources to obtain new types of data.

- It is also worth assessing the feasibility of introducing BI systems in small enterprises. What types of BI systems can be used in this type of enterprise?

- At the time of the study, all freely available BI tools were considered. Due to the constant development of technology, perhaps new tools have appeared. There is a problem of the relevance of research and the need for constant review.

The reported study was funded by RSCF according to the research project № 19-18-00452.

References

1. <https://news.rambler.ru/economics/36887142-chto-takoe-big-data-sobrali-vse-samoe-vazhnoe-o-bolshih-danniyh/> (Last accessed 24.11.2018)
2. <https://marketing.rbc.ru/articles/10345/> (Last accessed 25.11.2018)
3. <http://www.tadviser.ru/index.php/> (Last accessed 02.12.2018)
4. <http://www.tadviser.ru/index.php/> (Last accessed 03.12.2018)
5. I. V. Ilin, O. Yu. Ilyashenko, S. V. Shirokova, A. I. Levina, O. Hamalainen, *Big data for business analytics* (Saint-Petersburg, 2016)
6. O. Yu. Ilyashenko, I. V. Ilyin, A. A. Lepekhin, Science and business: ways of development **8(74)**, 59-66 (2017)
7. O. Yu. Ilyashenko, I. V. Ilyin, A. D. Borremans, Perspectives of science **6(93)**, 65-69 (2017)
8. A. D. Borremans, I. M. Zaychenko, O. Yu. Iliashenko, MATEC Web ofConferencesInternational Science Conference on Business Technologies for Sustainable Urban Development, SPbWOSCE 2017, **170**, 010342017 (2018)
9. A. I. Klimin, D. V. Tikhonov, A. M. Efimov, *Proceedings of the 30th International Business Information Management Association Conference. Vision 2020: Sustainable Economic development, Innovation Management, and Global Growth*, 1465-1483 (2017)
10. D. Laney, *3D data management: Controlling data volume, velocity and variety* (META Group Research Note, 2001)
11. H. Chen, R.H.L. Chiang, V.C. Storey, MIS Quarterly, **36(4)**, 1165-1188 (2012)

12. <https://lpgenerator.ru/blog/2015/11/17/chto-takoe-big-data-bolshie-dannye-v-marketinge-problemy-algoritmy-metody-analiza/#market> (Last accessed 22.11.2018)
13. https://www.rbc.ru/technology_and_media/27/03/2017/58d551429a794719618a4245 (Last accessed 16.11.2018)
14. https://www.nytimes.com/2012/02/19/magazine/shoppinghabits.html?pagewanted=1&_r=1&hp (Last accessed 17.11.2018)
15. M. Hilbert, *Big Data for Development: A Review of Promises and Challenges. Development Policy Review* (2015)
16. R. Kitchin, G. McArdle, *Big Data & Society* **3(1)**, (2016)
17. <https://siliconangle.com/blog/2013/08/06/sap-completes-acquisition-of-cloud-ecommerce-specialist-hybris> (Last accessed 11.11.2018)
18. O. Rud, *Business Intelligence Success Factors: Tools for Aligning Your Business in the Global Economy* (Hoboken, Wiley& Sons, N.J., 2009) ISBN 978-0-470-39240-9
19. <http://www.tadviser.ru/index.php/> (Last accessed 21.11.2018)
20. HSE, <https://www.hse.ru/data/2015/10/12/10761059225.pdf> (Last accessed 26.11.2018)
21. http://primmarketing.ru/analytics/2013/06/14/bi_marketing (Last accessed 26.11.2018)