

# Analysis of business intelligence tools and development of solutions for marketing activities

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**Abstract**—The objective of the research is the analysis of business intelligence tools and development of solutions for marketing activities based on business intelligence tools. In the framework of the current research, following methods have been used: analysis and modeling. Text sources were analyzed in order to describe and classify use cases of big data in marketing activities and to describe and classify big data and business intelligence tools and technologies in marketing. As the result of the research, a big data classifier for marketing activity was developed and possible solutions for marketing activity analytics were studied and proposed. The classifier can be considered a new result of the study, since there was no classification of big data in marketing activities so far. The current research can be used to help organization of BI analytics in marketing activities. However it is necessary to consider actualization of data on existing tools and technologies.

**Keywords**—marketing, big data, business intelligence

## I. INTRODUCTION

Making enterprises more customer-centric, sharpening focus on key initiatives that lead to entering new markets and creating new business models, and improving operational performance are three dominant factors driving analytics, Big Data, and business intelligence investments today. Unleashing the insights hidden in unstructured data is providing enterprises with the potential to compete and improve in areas they had limited visibility into before.

According to the forecasts, by 2020, predictive and prescriptive analytics will attract 40% of enterprises' net new investment in business intelligence and analytics [1, 2].

The global big data and business analytics market was valued at 168.8 billion U.S. dollars in 2018 and is forecast to grow to 274.3 billion U.S. dollars by 2022, with a five-year compound annual growth rate (CAGR) of 13.2 percent. Revenue from big data and business analytics worldwide from 2015 to 2022 (in billion U.S. dollars) is showed in Fig. 1 [3].

In Fig. 2, the statistic shows the leading industries based on their share of the global big data and analytics market in 2019.

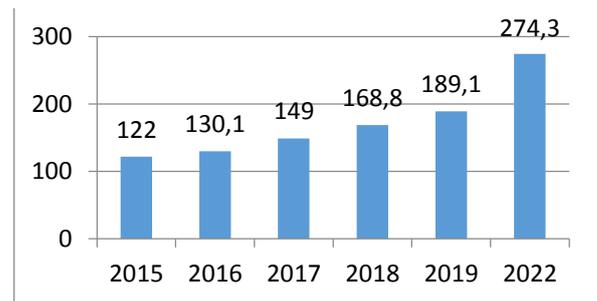


Fig. 1. Revenue from big data and business analytics worldwide from 2015 to 2022 (in billion U.S. dollars)

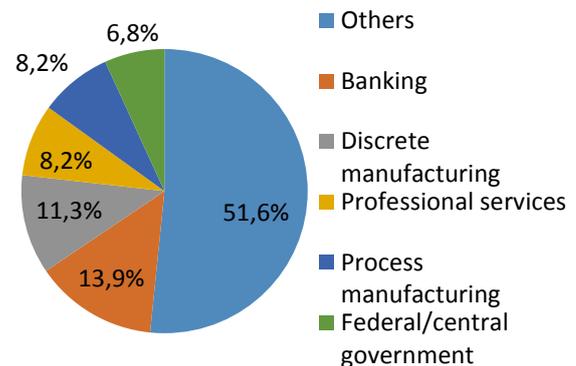


Fig. 2. Share of big data and business analytics revenues worldwide in 2019, by industry

In 2019, banking will be responsible for producing 13.9 percent of big data and business analytics revenues. In total, the market is forecasted to grow to 189.1 billion U.S. dollars in revenue in that year [4].

In the present day, the Big Data approach is increasingly entering various areas of business and our life. Mainly, 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 [5, 6].

One of the most attractive segments for analytics usage is trading [7]. 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 [8, 9]. Therefore, BDA and BI-systems have great potential for use in marketing.

The objective of the research was the analysis of BI tools and development of solutions for marketing activities based on BI tools.

The objective of the research is relevant first of all because there is no sufficient theoretical foundation and background for development of BI and Big Data technologies in marketing. 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.

**II. METHODS OF THE RESEARCH**

In the framework of the current research, following methods have been used:

- Analysis. Text sources were analyzed in order to describe and classify use cases of Big Data in marketing activities and to describe and classify Big Data and BI tools and technologies in marketing.
- Modeling. The models of solutions for marketing activities were presented.

**III. RESULTS OF THE RESEARCH**

*A. Big Data in Marketing*

The term “Big data” is used for data sets that are too large or complex to be adequately managed by traditional data-processing application software. Among big data challenges, there are 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 [10, 11, 12, 13]. Such indicators as target audience, interests, demand, consumer activity can be determined with help of big data analysis [14]. 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” [8]. 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. Sometimes such materials can be publicly available, most often part of the material is confidential. Due to this fact, 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 [15].

A serious challenge was faced by data-scientists of Target back in 2012 [16]. Once as a woman gives birth, advertisers record this moment and immediately offer her to buy everything she needs, whether it be a stroller, diapers or baby clothes. But what if she can be targeted before the baby is born?

Researching data on consumer habits of their customers, Target discovered 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.

Since then 7 years have passed, and a large number of social networks, new types of information about customers and the like have appeared and continue to appear [8]. Further we will describe and classify existing Big Data and BI tools and technologies in marketing, and also we will give ideas of what should be expected in future.

Marketing activities and modern use of types and sources of Big Data in them are shown in Table I.

TABLE I. MARKETING ACTIVITIES AND SOURCES OF BIG DATA FOR THEM

Marketing Activity	Purpose	Types of Big Data	Sources of Big Data
Advertising: • Target advertising • Development of advertising appeals	to display advertising (based on the RTB-auction model - Real Time Bidding) only to those consumers who are interested in the product or service		
Strategic plan adjustments and operational decisions	to research into attitude towards the brand	<ul style="list-style-type: none"> <li>• user accounts</li> <li>• registration data</li> <li>• Internet and mobile activity data</li> <li>• geolocation data</li> <li>• CRM data</li> <li>• production processes data</li> <li>• offline data about the customer actions</li> </ul>	<ul style="list-style-type: none"> <li>• social networks and email</li> <li>• websites and instant messengers</li> <li>• mobile operators</li> <li>• mobile devices</li> <li>• organizations</li> <li>• sensors in including messages between machines (M2M, IoT)</li> <li>• customer cards</li> </ul>
Development of new products and offers	to bring new products to the market, to seize new market segments and to improve products and make customers follow the brand, the product, etc		
Development of loyalty systems and promotional offers	to provide the company / brand / service with loyal customers; to increase sales temporarily, to increase interest in the brand; part of the strategy of bringing new products to market		

Marketing Activity	Purpose	Types of Big Data	Sources of Big Data
Demand prediction	to predict demand in order to plan purchases and supplies		
Price formation	to provide a competitive price and timely update prices		

As future possibilities for use of Big Data in marketing activities, we can mention following:

- Collecting data about the actions of other companies from mass media;
- Collecting offline data about the customer actions from sensors, trackers, etc.
- Search for new data, creation of combinations of data and determination of correlations between them.

**B. Business Intelligence in Marketing**

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.

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 [17].

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.

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].

Marketing activities and place of BI in them are shown in Fig. 3.

**C. Business Intelligence Technologies and Tools in Marketing**

Fig. 4 shows Gartner Magic Quadrant for Analytics and Business Intelligence Platforms 2019 [19]. We can see that the leaders are Microsoft, Tableau, Qlik and ThoughtSpot – they have both the best ability to execute and the best completeness of vision.

Next, in Table II we present software tools and technologies that can be used for gathering or/and analyzing Big Data in marketing. There is a tendency of using platform services in the Internet [20].

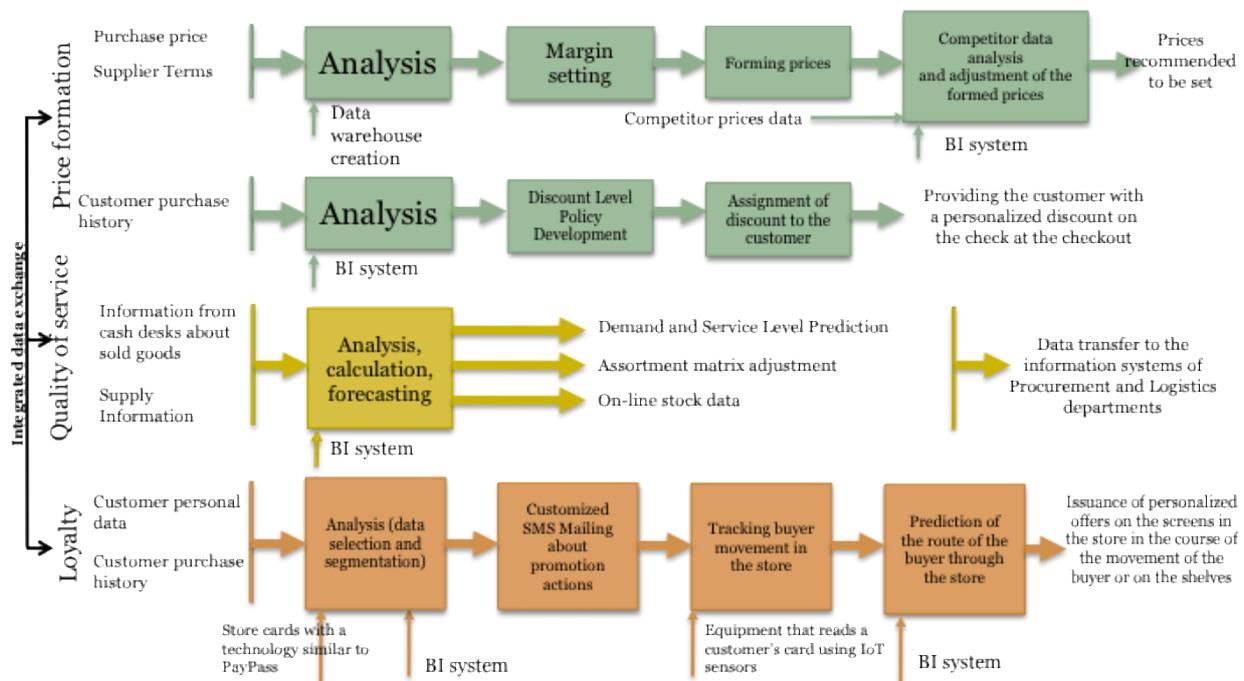


Fig. 3. Marketing activities and place of business intelligence in them

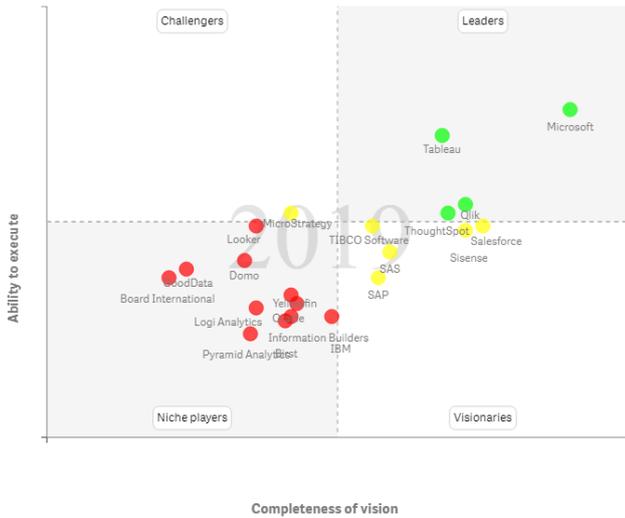


Fig. 4. Gartner Magic Quadrant for BI [19]

TABLE II. BIG DATA AND BUSINESS INTELLIGENCE TOOLS AND TECHNOLOGIES IN MARKETING

Vendor	Name	Free or Paid	Special Features	Functionality for Gathering Big Data	Functionality for Analysing Big Data
Google	Search	Free	Search Engine	Yes	No
	Ads	Paid pay-per-click	Online advertising platform	No	Yes
	Analytics	Both paid and free versions	Tracks and reports website traffic	Yes	Yes
	Trends	Free	Website	No	Yes
Yandex	Search	Free	Search Engine	Yes	No
	Direct	Paid pay-per-click	Online advertising platform	No	Yes
	Metrica	Free	Tracks and reports website traffic	Yes	Yes
SAP	HANA	Both paid and free versions	Database management system	Yes	No
	Hybris	Paid	E-commerce platform + unique services for marketing	Yes	Yes
Microsoft	Cortana Intelligence Suite	Paid	Fully managed big data and advanced analytics suite	Yes	Yes
	Dynamics CRM	Paid	Customer relationship management software package	No	Yes

Vendor	Name	Free or Paid	Special Features	Functionality for Gathering Big Data	Functionality for Analysing Big Data
	Azure	Both paid and free versions	Cloud computing service	Yes	Yes
	SQL	Paid	Database management system	Yes	Yes

D. Solutions for Marketing Activities

Here we present algorithms for analytics in marketing. First algorithm we want to present is the easiest and the cheapest.

It starts with that the user enters the site with contextual advertising, then calls and makes a purchase. CRM gets data about him – the source of the transition, user ID, client ID, etc. When he calls, the same data about him is transmitted into CRM by call tracking. All that needs to be done is to collect this data together and relate it to the transaction that the customer has performed.

Then there should be following steps.

On the first step you unload lead data from CRM. This is done quite simply – most systems provide the ability to create individual reports using filters and export them to xls or csv.

Next, you create a document (table) for the data. Enter to it the data on the number of leads from each of the sources. So you can immediately see how many leads has been brought by given advertising channel in general and how many of them were quality ones. Also you can see the quality of leads by channels.

In the same way, upload data about transactions and transfer them to a special table. You should also divide it into advertising sources, the number of users and the amount of payment.

Here we need to clarify: in order for you to get data about transactions, your managers should indicate the exact amount of the transaction, closing it in CRM. Ideally, this should also be controlled by the base cleaner.

Last we create a final document in which we will calculate KPI: the number of MQL and SQL, the transactions - the number and amount, marketing investment, LAC, CAC and ROMI.

The data movement in this algorithm is showed in Fig. 5.

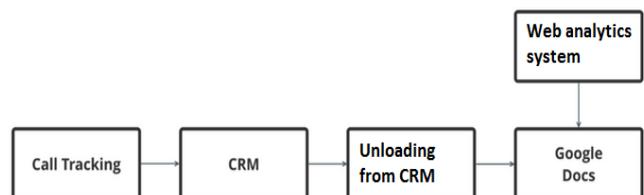


Fig. 5. Illustration for the Easy Algorithm [21]

The next algorithm is medium and it supposes the use of end-to-end analytics. Due to the end-to-end analytics system, all data is gathered automatically, minimizing manual actions. But the ability to customize reports is severely limited. There is a set of standard reports.

The essence of the algorithm is as follows:

On the first step, we take all the same tools as before.

Then, we import data from these systems into the end-to-end analytics system.

Next, we also unload transaction data from the registration system into the end-to-end analytics system.

In the end, we get ready reports.

The data movement scheme in this case will look like in Fig. 6.

The next algorithm can be classified as “hard”. It gives access to all the capabilities of end-to-end analytics, without restrictions in reports and in solving the necessary tasks. This way is used if we want to get all the possibilities of end-to-end analytics. It requires money, clear understanding the data and knowledge about how to work with it.

Here we also connect Google Analytics and Call Tracking, implement CRM.

Then, we set up streaming data in Google BigQuery.

To process data, we need BI platforms - OWOX BI or MixData BI.

We configure the transfer of transaction data from the registration system into Google BigQuery.

Last, we get the necessary reports and visualize them using Google Data Studio or Microsoft Power BI [21].

The data movement scheme in this case will look like in Fig. 7.

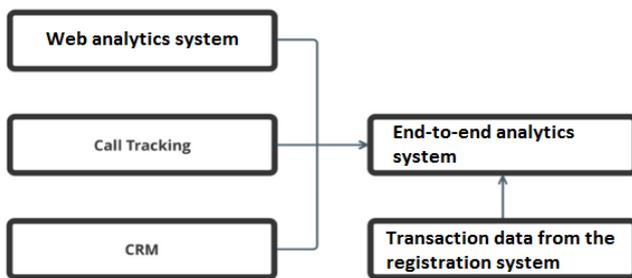


Fig. 6. Illustration for the Medium Algorithm [21]

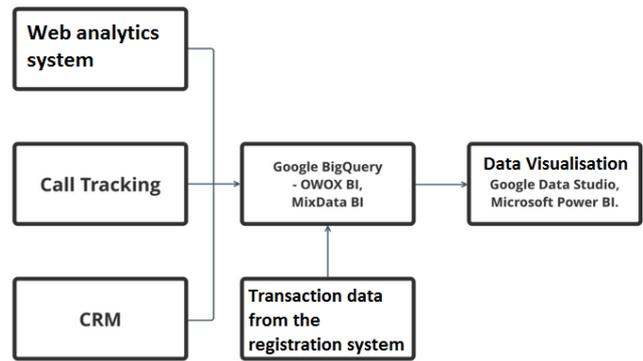


Fig. 7. Illustration for the Hard Algorithm [21]

#### IV. DISCUSSION

Based on the study, the classification obtained and the solution set under consideration, the following conclusions can be drawn. These conclusions can be used as criticism for this article and consider these points in future studies.

First of all, it should be noted that in this study we consider a limited set of tools. Perhaps there are tools with more advantageous functionality that are beyond the scope of the tools we are considering.

The existence of such tools is possible due to the fact that the sphere considered in this article is very intensive, this sphere is changing rapidly and evolving rapidly [22]. In addition, as already noted, the study of BI-tools in marketing activities was not sufficiently considered in the articles of other authors.

The big advantage of our article is that we managed to systematize the Big Data for marketing activity, but obviously this is not a complete classification. This problem is primarily related to the fact that different companies use different data for marketing activities. Also, some of this data is confidential, we can only use information from open sources.

That is why in future articles and future studies there is the primary task of finding new links and correlations between different types of data, between different sources. This is primarily necessary in order to create new data sets, analyze correlations within them, in order to get new results and apply them to adjust strategic and operational marketing campaigns.

Also, based on the conclusion that BI systems are a very costly tool and an enterprise should be ready to implement this tool, one of the directions of future research can be defined as “BI-tools for small enterprises”.

In the face of existing competition, small businesses will need to use BI analytics to be competitive. It is necessary to investigate which tools they can use and which tools will be cheap enough for small enterprises. In addition, it is necessary to investigate how the first solution scheme described in this article will be applicable in real conditions for small enterprises.

Since the area of research under consideration is dynamically changing, there is a problem of the relevance of research on this topic. It is necessary to constantly update the data on the topic and bring the research to the current form. Due to the actualization of data, it will be possible to use

research on the topic as a practical tool for organizing BI analytics in marketing activities.

#### V. CONCLUSION

So, the main goals that were achieved in this article were: the developed Big Data classifier for marketing activity.

Such a classifier is a new result of the study, since we did not find information on the classification of Big Data for marketing.

In addition, possible solutions for marketing activity analytics were studied and proposed.

The main findings of the article and the results for future research were described in the paragraph above.

We also believe that a good basis for future articles can be considered an experiment that should be carried out to test these solutions.

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