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THE SOCIAL AND ETHICAL CHALLENGES CONNECTED WITH THE BIG DATA PHENOMENON

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Abstract: The goal of this paper is to analyze the socio-ethical challenges connected with utilization of the Big Data phenomenon by organizations. It is composed of five parts. The first part contains a brief overview of the situation related to the ever increasing amounts of data in the contemporary socio-economic sphere. The next is focused on the Big Data phenomenon and the significant sources behind the growth in data. The following part is devoted to an analysis of the opportunities and benefits connected with the utilization of Big Data. The fourth part focuses on the most significant obstacles and challenges connected with Big Data, with special attention paid to social and ethical issues. The final part of the paper contains the most significant conclusions and suggestions.

Key words: datafication, business analytics, data driven decision-making, socio-ethical disputes.

Introduction

Contemporary organizations are dealing with quickly and ever increasing amounts of data that are being generated in the socio-economic space. According to the estimations of Siegel, 2.5 quintillion bytes of data are added every day (Hayashi, 2012). And it is emphasized that this amount doubles about every forty months (Brynjolfsson and McAfee, 2012). This is the result of the rapidly growing quantity of data that is generated not only by the organizations themselves but also in the organizations' business environments.

These processes are significant elements of the socio-economic changes taking place worldwide, where the extremely dynamic development of increasingly powerful and pervasive information technology has an important role to play. Recently, the field of information technology has begun to enter a new era. It is an era where processing power and data storage have become virtually free, while networks and cloud-based solutions provide users with global access and wide-ranging services. As a consequence of these processes, both spheres i.e. the economic and the social, are generating, sending and collecting a rapidly growing amount of data and information.

Organizations are functioning in environments saturated with data and, as a result, the amount of data and information available to them for analysis is exploding. This provides them with completely new operating possibilities, while simultaneously generating numerous new challenges. In this context the term "Big Data" has emerged and is being used more and more commonly in the business world.

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The notion of Big Data and the most significant sources behind the growth of data in the contemporary socio-economic reality

Contrary to its name, the Big Data phenomenon does not solely relate to the issues connected with large amounts of data. The character of the data that organizations are dealing with has radically changed as well (Davenport and Kim, 2013). The data sets are becoming unstructured to a considerable degree, more and more granular, increasingly diverse, iterative, fast-changing, and available in real-time.

If the definition of the term Big Data is considered according to the NewVantage Partners "Big Data as a term used to describe data sets so large, so complex or that require such rapid processing (sometimes called the Volume/Variety/Velocity problem), that they become difficult or impossible to work with using standard database management or analytical tools" (NewVantage, 2012).

Generally, there have been four significant trends that have caused a considerable increase in data generation. The first one, the growth in traditional transactional databases, is chiefly connected with the fact that organizations are collecting data with greater granularity and frequency. This is due to reasons such as the increasing level of competition, increasing turbulence in the business environment and the growing expectations of customers. All of these factors necessitate organizations to react rapidly and with maximum flexibility to the changes taking place and adjust to them. In order to be able to do this, they are forced to conduct more and more detailed analysis concerning marketplaces, competition and the behavior of consumers.

The second trend is connected with the rapid increase in the use of multimedia in the industries of the contemporary economy. As a result, multimedia data already accounts for over half of Internet backbone traffic (McKinsey, 2011).

The third trend which has caused a growth in the amount of data being generated is the development of the phenomenon called "The Internet of Things", where the number of physical objects or devices that communicate with each other without any human interference is increasing at a fast pace. By 2015, the amount of data generated from the 'Internet of Things' will grow exponentially as the number of connected nodes deployed in the world is expected to grow at a rate of over 30% per year (McKinsey, 2011).

Social media is the fourth extremely significant source of the increase of data. In the case of Facebook only, in 2013 over 1.2 billion of its users generated huge amounts of data every day. They uploaded an average of 350 million of photos, sent 10 billion messages, and shared 4.75 billion items (Smith, 2014).

Opportunities for the utilization of the Big Data phenomenon by contemporary organizations

The Big Data phenomenon is attracting an increasing amount of attention of managers of contemporary organizations, as confirmed by the results of various pieces of research. According to the results of a survey of Fortune 1000 C-level

executives and executives responsible for Big Data conducted in 2013 by NewVantage Partners, 91% of those surveyed stated that that their organization had a Big Data initiative in progress or planned (NewVantage, 2013). Also the results of the global survey conducted in the same year by the EMC Corporation in fifty countries show that there is a significant level of interest from organizations in the utilization of solutions belonging to this IT trend (EMC, 2013).

This fact is also confirmed by data concerning the value of the Big Data technology and services market. According to the research firm IDC, this market will grow at a rate of 27% (year on year) and in 2017 it will reach 32.4 billion USD. It means that this market is expected to grow at a rate that is six time stronger than the whole IT market (Bednarz, 2014).

In the context of the above mentioned facts, there are two important questions that arise. Namely, what new possibilities does the Big Data phenomenon provide and what kind of opportunities and benefits can it bring organizations?

Generally, the Big Data phenomenon is strictly connected with the trend which is increasing common among contemporary organizations i.e. competing on analytics. It has significantly expanded the possibilities available within the scope of usage of business intelligence (BI) tools. Providing organizations with numerous possibilities and opportunities in the field of analytics, business intelligence systems are well suited for aggregating and analyzing structured data (Capgemini, 2012). But there are, however, some types of analyses that BI can not handle. These mainly relate to the above mentioned situations where data sets become unstructured to a considerable degree, more and more granular, increasingly diverse, iterative, fast-changing, and available in real-time. Such types of data pose problems when trying to apply traditional approaches based on relational database models. As a result, it has become apparent that there is a growing demand for a new class of technologies and analytical methods.

According to the McKinsey Global Institute, there are five key ways in which the Big Data phenomenon creates value for organizations. They are (McKinsey, 2011):

- creating transparency by integrating data and making it more easily accessible to all relevant stakeholders,
- enabling experimentation to discover needs, expose variability, and improve performance,
- segmenting populations in order to customize actions,
- replacing or supporting human decision making with automated algorithms,
- innovating new business models, products and services.

The expectations of executives connected with Big Data mainly relate to issues concerning the improvement of the quality of their decision making (EMC, 2013). Simultaneously they are counting on the possibility of faster, fact-based decision making. So in this context the key value connected with Big Data is accelerating the time-to-answer for critical business questions (NewVantage, 2013). So these two aspects i.e. making better decisions and faster are, according to the results of

the survey conducted by IDC, the two key goals in the context of the programs connected with Big Data utilization (Bednarz, 2014).

Despite Big Data being quite a recent phenomenon, there are numerous examples of organizations effectively utilizing the possibilities connected with it. According to Davenport and Kim there are some types of business decisions that can be made analytically, including: marketing, supply chain, finance, human resources and research and development (Davenport and Kim, 2013). The results of various pieces of research indicate that one more sphere should be added to this list cybersecurity (Smith, 2013).

As far as decision-making is concerned, an extremely important new element, connected with the Big Data phenomenon, is the possibility for constant business experimentation to guide decisions and test new products, business models, and customer-oriented innovations. Such an approach even allows, in some cases, for decision making in real-time.

There are many examples of companies using this in practice. For example multifunctional teams in Capital One perform over 65,000 tests each year. They experiment with combinations of market segments and new products (Bughin, 2010). On the other hand, eBay systematically improves its Internet-based products based on huge sets of behavioral data generated by users utilizing them at scale (Ferguson, 2013). Netflix, the provider of on-demand Internet streaming media, captures quick feedback to learn what particular programs have the greatest audience, using this knowledge to adjust its offer (Rosenzweig, 2014).

The utilization of Big Data in competitive intelligence systems has also become a very significant sphere in the support of decision-making. It relates to such issues as the usage of various tools for "catching" and analyzing signals, sometimes every week, generated in social media. This type of real-time information can be crucial in the context of preempting the actions of competitors or adjustments of strategy (Harrysson, 2012). Such signals can be also used in the context of making decisions such as when to launch new products or services or help solving customers' problems. TomTom, a manufacturer of automotive navigation systems, is an example of a company functioning in this way. It "catches" and mines signals coming from the on-line driving community stream for ideas on design and product features and to quickly troubleshoot new offerings (Harrysson, 2014).

As far as marketing activities are concerned, apart from the above mentioned competitive intelligence, there are many fields where the Big Data phenomenon has been utilized. One of the most important of these fields is targeted advertising. The Target Corporation, which is one of the biggest American retail companies, is an example of an organization which is very successful in this field. The company very strongly developed its usage of business analytics which had a significant impact on its revenues. It became famous for the fact that their business analytics were able to build a model that, based on the shopping habits of their clients, allowed the company to predict, with a high degree of probability, which of their customers was pregnant and her delivery date. Linking this information with other

data (client ID, name, credit card number or e-mail address) enables the company to reach expectant mothers with precise offers for baby items (Duhigg, 2012).
Activities from the field of targeted advertising are strictly connected with another quickly developing trend whereby marketers use the tools associated with the Big Data phenomenon: marketing automation. Google is an example of an organization which broadly uses business analytics of huge, unstructured data sets for the automation and individualization of advertising offers. In the case of Gmail, the company uses the automated scanning and processing of sent or received email content (Kirk, 2013).
Human resources are a further example of a functional field where the Big Data phenomenon is being utilized, and in this context the term „people analytics" has emerged. This means the fast-growing practice of using large amounts of various data sets generated by employees and business analytics to quantify those already employed and to assist in the selection of new ones (Peck, 2013). Google is one of the leaders in this field and has completely rebuilt its HR system as a result (Sullivan, 2013).

Challenges and implications connected with Big Data utilization

As in the case of other IT-related initiatives, Big Data also has its own set of problems and challenges. They include difficulties of a technical, organizational and legal nature. Those in the first category are connected with such issues as the selection of the most useful techniques, technologies and tools or the creation of an efficiently functioning system for feeding the most relevant data to support the organizational goals. In the context of Big Data initiatives, the data used should be "smart data". That is, it should be accurate (it must be precise enough), actionable (it must drive an immediate scalable action) and agile (it must be flexible) (Ferguson, 2014).
In the case of organizational challenges, these are connected with such issues as the selection of the proper people (the term "data scientists" is most commonly used), updating business processes and developing capabilities to enable Big Data tools utilization or changes in organizational culture (Wielki, 2013). The challenges connected with legal rights relate to such issues as copyright, database rights, confidentiality, trade marks, contract law, competition law (Kemp, 2013). An additional legal challenge worth mentioning is the risk associated with the utilization of Big Data to increase the automation of decision-making (Wielki, 2013).
Apart from the above mentioned challenges, the development of the Big Data phenomenon and its utilization is connected with numerous socio-ethical disputes. It is import for companies to find and maintain a balance between the benefits and tremendous opportunities connected with Big Data and the potential risks and challenges. This relates to both established challenges which have been deepening and to emerging new ones. Organizations have to remember that technologies

connected with Big Data, as with any other technology, are ethically neutral, but their utilization is not (Davis and Patterson, 2012).

According to Davis and Patterson, there are four elements that define a framework for Big Data ethics, i.e.: identity, privacy, ownership, reputation (Davis and Patterson, 2012).

If the first issue is considered, it is argued that the identity of people is multifaceted, which means that it is hard to be aggregated for a consumption by a single organization. Big Data technologies change this situation. They provide an organization with the ability to summarize, aggregate or correlate various aspects of the identity of every consumer without his or her participation or agreement and to undertake appropriate or inappropriate action (Davis and Patterson, 2012).

The above mentioned activities of Target are an example of the ethical challenges related to this issue. Based on the analysis of the shopping habits of their clients, the company is able to predict, with high probability (about 90%), which of their clients is pregnant and the delivery date. Combining this information with other information, the company can reach expectant mothers with precise offers (in this case coupons for baby items). But due to a situation where Target knew about a teenage girl's pregnancy before her father, made the company aware that in spite of benefits of business analytics usage, there were also significant risks connected with it. They relate to questions around how Target was able to identify its pregnant customers and the problem of potential accusations from clients that the company was spying on them (Duhigg, 2012). This last issue can be important because of the fact that companies who are providers of Big Data analytics solutions for physical storefronts (such as RetailNext) collect shopper data from a variety of sources such as POS systems, RFID tags, and also surveillance video (Parasuraman, 2013).

In the context of identity there are some issues which are extremely important. They include: personally identifying information, the anonymization of data sets, and reidentification or cracking back (Davis and Patterson, 2012). These issues have emerged in the context of activities of companies such as Facebook, MySpace and several other social-networking sites and were identified a few years ago. Namely, they have been sending data to advertising companies that could be used to find consumers' names and other personal details (Wielki, 2012). These issues are also very important in the context of the business activities of enterprises called "data brokers". These companies are collecting, analyzing and packaging the most sensitive personal information, i.e. that which is individually identified, and selling it to each other or to advertisers (Kroft, 2014).

The second element of a framework for Big Data ethics is privacy. This aspect is repeatedly a matter of interest and discussions in the context of the utilization of information technology and the range of challenges connected with this issue have significantly increased with the entrance of the Internet into the contemporary socio-economic reality. The issues connected with privacy are extremely important

because of the fact that personal data has become a "new asset" in the contemporary economic reality, and as the above mentioned "data brokers" treat them as a "commodity" (Kroft, 2014).

There are numerous questions and issues that arise in this context, but the most important ones relate to the problem of whether individuals should have the ability to control data about them and to what extent. These issues are extremely important in the context of the activities of firms utilizing business analytics such as Google, Facebook, but also for "data brokers" (e.g. Axciom).

In the case of Google, it relates to activities such as the above mentioned automated scanning and processing of e-mail content for emails that are sent or received by Gmail users. Particular reservations are connected with the fact that the company also applies the scanning to e-mails sent to Gmail users from other e-mailing systems by people who haven't accepted its privacy policy (Kirk, 2013).

In the case of Facebook, the company is currently being sued over claims that it mines users' private messages. Users believed that they had a private and secure mechanism for communication with their acquaintances and friends and they felt the company had breached that principle (Rushton and Trotman, 2014).

The third element of a framework for Big Data ethics is ownership. This issue is connected with answers to such questions as (Davis and Patterson, 2012):

- who owns data?
- can rights to data be transferred?
- what are the obligations of companies who use data?

The issues connected with ownership were previously a subject of challenges several years ago in the context of early dot-com retailers (HealthCentral.com), and their significance grows in the Big Data era. The issues are connected with such situations as the above mentioned case of Facebook who mined private messages of its users to advertisers. The issues relating to ownership are particularly important from the point of view of such sensitive sectors as health care, which is strongly involved in Big Data utilization (McKinsey, 2011). They are also significant in the context of the activities of such companies as the above mentioned „data brokers" (Kroft, 2014).

Reputation is the fourth element of a framework for Big Data ethics. In this context it is necessary to note that issues related to this aspect are on one hand connected with companies implementing programs relating to the utilization of the Big Data phenomenon, while on the other hand with the reputation of their clients. The above mentioned activities of Google or Facebook influence their reputation and image in a decidedly negative way. In the case of Target the duality of influence of Big Data phenomenon can be clearly noticed. On the one hand suspicions of spying on clients can lead to a public-relations disaster, and consequently influence the financial results of the company. On the other hand, there are issues connected with the impact on the reputation of its clients. In this case the teenager who was a recipient for advertisements for baby items from Target, before she had made her situation widely known.

In the context of reputation it is worth mentioning that there is one more significant challenge connected with the utilization of data in Big Data systems. This aspect relates to the issue of how to determine what data is trustworthy. It is an important challenge because of the fact that the amount of data and the ways organizations can interact with them is increasing exponentially (Davis and Patterson, 2012).

As far as the current ethical practices of organizations which use Big Data are concerned, Davis and Patterson conducted primary and secondary research concerning this aspect. Among other issues they reviewed the public-facing policy statements of the top 50 Fortune 500 corporations. The results of their research provides us with view of these issues, albeit a limited one.

40 of the 50 policies surveyed indicated that the corporation would share personal data with third-party service providers. In the case of selling personal data, 34 of the 50 policies stated unequivocally that the organization would not sell personal data without consent. If the problem of buying or "obtaining" personal information is considered 11 of the 50 policies stated that the corporation would buy or "obtain" personal information from any third parties.

In addition, the issues connected with control over the personal data were researched. For 33 of the 50 policies, they stated that a user could control the utilization of his or her data. Thirty one of them explained how to opt out.

If the issues connected with anonymization, personally identifying information, and privacy are considered, for 47 of the 50 policies a distinction between "personally identifying information" and information that is "anonymized" was made. But only 10 of the 50 policies clearly stated that "anonymized" data sets were not treated by the company as protected.

In the case of Big Data, there is one more aspect which is important. It relates to the issues connected with the aggregation of a user's data with data obtained from other sources. For 24 of the 50 policies companies stated or suggested that user data would be aggregated with data coming from other sources (Davis and Patterson, 2012).

Conclusions

The rapidly increasing amounts and diverse sources of data and information which organizations have at their disposal are connected with a growing number of possibilities which offer rapidly developing analytical tools that are having an increasingly significant impact on their functioning and competitive advantage. Because of this, an increasing number of organizations have been implementing Big Data initiatives in order to utilize opportunities connected with business analytics usage.

In the context of such initiatives, a number of challenges, typical for IT-related projects, emerge. But in the case of the projects connected with Big Data, one sphere is at the forefront. This is the sphere of ethical challenges. It is connected with the fact that Big Data creates, compared to other IT-related initiatives, a much broader set of ethical challenges and concerns. They especially relate to a broadly

understood privacy, which is the issue which is more and more commonly publicly noticed and discussed (Kroft, 2014).

So if organizations want to be able to utilize emerging opportunities connected with the Big Data phenomenon, these issues must be especially carefully addressed by them. It is particularly important that every company utilizing Big Data implements internal practices which will reinforce proper data management (Brown, 2014), including establishing ethical decision points which should assure the existence of a proper relationship between the values held by organizations and aligning those values with the actions undertaken by them (Davis and Patterson, 2012). Another key issue is appropriate contact with customers. On one hand, this should be connected with organizations communicating to their clients the benefits to them of the company using data analytics. On the other hand, it is extremely important that more control of personal data and information should be put in the hands of the consumer which will help build their trust (Brown, 2014). It will be undoubtedly an important issue in the context of eliminating suspicions regarding Big Data initiatives and supporting their successful finalization.

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SPOŁECZNE I ETYCZNE WYZWANIA ZWIĄZANE ZE ZJAWISKIEM BIG DATA

Streszczenie: Celem niniejszego artykułu jest analiza wyzwań społeczno-etycznych związanych z wykorzystaniem zjawiska Big Data przez organizacje. Składa się on z pięciu części. Pierwsza z nich zawiera krótki przegląd sytuacji związanej z gwałtownym przyrostem ilości danych w sferze społeczno-ekonomicznej. Kolejna koncentruje się na zjawisku Big Data i najważniejszych źródłach przyrostu danych. Następna część poświęcona jest analizie możliwości i korzyści związanych z wykorzystaniem Big Data. Czwarta część artykułu koncentruje się na kluczowych wyzwaniach i przeszkodach związanych z praktycznym wykorzystaniem Big Data, ze szczególnym uwzględnieniem kwestii społeczno-etycznych. Przedstawiona jest w niej również analiza rozwiązań obecnie stosowanych w tej sferze przez organizacje. Ostatnia część artykułu zawiera najważniejsze konkluzje i sugestie.
Słowa kluczowe: „daneizacja", analityka biznesowa, kontrowersje społeczno-etyczne.

跟大數據現象的社會和倫理挑戰

摘要：本文的目的是分析與組織利用大數據現象連接社會和倫理挑戰。它由五個部分組成。第一部分包含了相關的日益增長的數據量在當代社會經濟領域的情況的簡要概述。接下來的重點是大數據的現象和數據增長背後的顯著來源。下面的部分是專門用於大數據的利用連接的機會和利益的分析。第四部分集中在支付給社會和倫理問題與大數據連接最顯著的障礙和挑戰，要特別注意。文章的最後一部分包含了最顯著的結論和建議
關鍵詞：datafication，業務分析，數據驅動的決策，社會倫理爭議