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Achieving Competitive Advantage in the Age of Cloud Computing and Big Data

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**Achieving Competitive Advantage in the Age of Cloud Computing
and Big Data**

by

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За будућност.
Себи, својој породици, својој земљи.
Србији.
Свету.

For the future.
To myself, my family, my country.
To Serbia.
To the World.

Summary: Competitive advantage is an essence of business success. Over time, sources of competitive advantage changed. Due to technology development, cloud computing and big data have emerged as potential bases for mastering the market. The focus of this thesis are these three constructs and their relationship.

Key words: competitive advantage, cloud computing, big data, challenges, opportunities

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Chapter 1

Introduction

Understanding the role of big data and cloud computing in achieving competitive advantage cannot be properly understood without outlining a wider business context in which organizations operate. For that reason, the purpose of this chapter is to introduce readers to the current situation in the business and economic markets before getting into the details about the main topic of the thesis.

1.1 Economic Crisis as a Source of Change in Business Environment

The current situation caused by the economic recession is far from promising. Notwithstanding many trillions of dollars infused into the worldwide economy since 2008 by national banks in the US, UK, Europe, and mostly, as of late, Japan, the employment rate is globally decreasing. Effects of the global economic crisis are still being felt, and there are even strong indicators that the crisis is still leaving serious damage to the economies. Three huge worldwide investment patterns have started to increase and join recently (Rasmus, 2014):

1. a moderating of the China economy and a parallel developing budgetary shakiness in its shadow saving money framework;
2. a breakdown in the developing markets' monetary forms (India, Brazil, Turkey, South Africa, Indonesia, and so on) and their financial stoppage;

3. a proceeded float to collapse in the Eurozone economies, headed by developing issues in Italy and investment stagnation now spreading to France, the Eurozone's second biggest economy.

The issues in these three discriminating ranges of the worldwide economy, additionally, have started to nourish off of one another.

It should be noted that, in opposition to generally held observations throughout the blast years before the emergency, the worldwide economy was in no way, shape or form as steady as proposed, while in the meantime the number of the world's poor had profited inadequately from stronger monetary development (Plummer, 2009). Besides, there were intricate and interlinked elements behind the development of the emergency in 2007, specifically detached fiscal strategy, worldwide lopsided characteristics, misperception of danger and careless monetary regulation (Plummer, 2009). Thirdly, past the total picture of monetary crumple and climbing unemployment, the effect of the recession is fairly assorted, reflecting contrasts in introductory conditions, transmission channels and vulnerabilities of economies, alongside the part of government strategy in moderating the downturn (Plummer, 2009). Fourthly, while the recuperation stage has initiated, various dangers remain that could wreck enhancements in economies and block deliberations to guarantee that the recuperation is joined by occupation creation. These dangers relate specifically to the difficulties of managing open obligation and proceeding worldwide lopsided characteristics (Plummer, 2009).

1.2 Modern Business Environment

It is clear that the national and international environment is radically changing in the way that business is conducted. Global economies, being volatile and increasingly competitive, are forcing companies to find new strategies for growth and the increase of profits.

Organizations are currently placed in the middle of a worldwide economy that is described by more prominent and more serious rivalry, and also more prominent budgetary relationship and cooperation. More employees, services and products are continuously being expanded outside their nations. Yet in the meantime, amidst more prominent fluctuations, there is the inverse power of dissimilarity at work: organizations need to adjust corporate and business methods, promoting arrangements, and adjust to home markets in which they operate (Fischer, Ferreira, Assmar, Redford, and Harb, 2005).

More organizations are extensively using outsourcing in order to stay focused on their core activities (Johnson, 2006). Numerous capacities are continuously being moved to countries such as India, because the expenses of production are lower, as well as investments in workforce training, and information technology (Johnson, 2006). One important result of the globalization is more prominent portability in the global capital and work markets. This makes a worldwide commercial center in which there is more open door, due to the fact that there are more potential clients. In any case, there is likewise more rivalry, as national organizations need to contend with remote organizations for clients.

Globalization incites clashes inside and between countries over provincial standards and the social organizations that encapsulate them (Fischer et al., 2005). As the engineering for fabricated merchandise get institutionalized and diffused globally, countries with altogether different sets of qualities, standards, foundations, and aggregate inclination start to compete with businesses offering products from the same niche. Exchange gets antagonistic when it unleashes drives that undermine the standards verifiable in nearby or domesticated working environment polishes.

1.3 Position of Management in a Climate of Uncertainty

Since the economic crisis in 2008 the business environment has changed a lot. There is plenty of evidence suggesting that the market has become highly uncertain. Companies that did not adapt to this new way of functioning had troubles with maintaining their previous success, and it is not a small number of companies which closed or reported losses during the last five years. Competition is still very fierce, and companies are fighting for buyers who are gradually losing their buying power. As a consequence, customers are demanding higher quality for smaller amounts of money because their budget is more restricted than it used to be.

The position of management has also changed under the influence of economic recession. It is getting harder to make good managerial decisions, as they depend on a large number of external factors. Companies are no longer creating strategies which will only make them more competitive in comparison with others in the same sector. The element of innovation is instrumental, and the progress must be made before others get the same idea. There is an

exceptional quote that vividly explains current situation in the market:

Profound uncertainty also amplifies the importance of making decisions when the time is right—that is to say, at the moment when the fog has lifted enough to make the choice more than a crap shoot, but before things are clear to everyone, including competitors. (Lowell, 2010)

One of the most transparent examples of uncertainty that comes from the environment is the recession that began in the year 2008. It was quite unexpected that it would result in such big changes in the economic power of countries and companies. Even big companies such as Google and Apple suffered because of it. In cases like this one, it is almost impossible that manager can neutralize effects of something which deeply shook the whole world. It can be stated that in situations of global crisis good manager would find the strategy to minimize the losses as much as possible. Once when the financial crisis began, values of stocks fell, countries were losing economic power, customers no longer had buying power as they did before, demand for certain products drastically fell. Companies whose services or products were no longer high on the lists of priorities suffered the most. Changes of this scope can be hardly managed by individuals or small teams. Seven years from the moment when recession began, there is still no solution for it. Managers who occupied their positions at that moment had an uncomfortable task to try to save what can be saved. Some of them were successful while others did not manage to adapt to the situation, or their company did not have the resources to adapt successfully to this new environment.

Predictions for the future are not very at the moment when it comes to the economy. According to different estimates, it will take from 5 to 15 years for the world economy to return to the previous state. This means that economic situation in the world can be the source of potential changes in the future. As a consequence, managers can find themselves again in the situation to solve problems that are out of their reach. Adapting to changes in the global economy can be extremely hard if company's resources are scarce and momentous losses can be detrimental.

Not all changes in the environment must be regarded as negative ones. Changes in technology are something which managers will face more and more. The introduction of social media was one of the changes to which managers needed to adapt. Social media changed the way of communication between customers and companies. It also changed the way marketing messages are communicated to potential customers. These changes have been accepted by the majority of companies, and social media presence is today something which is

taken very seriously. Several years ago the situation was different, and managers had to make a decision whether this kind of communication should be implemented into company's strategy. Managers needed to find the way to keep on track with technological development. Although today lot of technological devices has been invented, there is still a lot of space for further development in this area. It is up to managers to decide whether the company should accept all kinds of technological advancements or only some of them are important for the company's success.

1.4 Impact of Technology on Business

Another factor which will be further discussed is the development of technology, which is also considered to be extremely important for the organizational environment. Development of this area enhances the productivity of a business. Hierarchical structure adjusts to these progressions by rebuilding divisions, altering position prerequisites or adding and removing job occupations. Organizations may add new divisions or occupations to have some expertise in new segments of the market. Sometimes, the introduction of new types of innovation may render certain employment obligations outdated in some branches.

It is believed that the development of technological science regularly lessens the number of monotonous office assignments or enhances effectiveness (Hsu and Lin, 2008). Changes in normal operation may come as a move-up to desktop machines, speedier office gear, or the presentation of another data framework. Entrepreneurs progressively use far-reaching programming stages to streamline operations. Customer relationship management (CRM) presents a valuable tool which is being widely used by companies as it enables them to track their customers' needs and more efficiently allocate their funds (Bohling et al., 2006).

The previously described effects of globalization and technological development are helpful for creating a picture of what may be required from organizations in the next five, ten or more years. Clearly, the flexibility of the organization is one of the key elements which will be necessary for successful operation. Secondly, innovative thinking by employees should be appreciated and appraised as it will significantly add to the value of a company. While this aspect has been recognized a while ago, it will become even more important in the future.

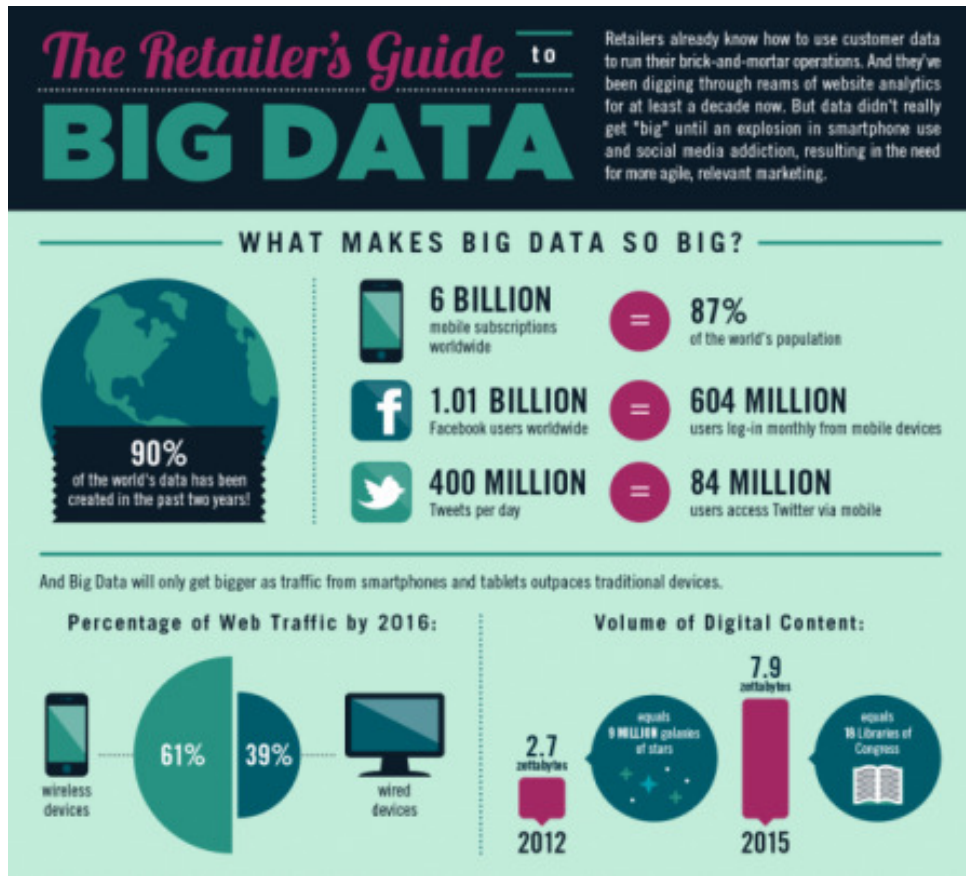
The beginning of the twentieth century was marked by a rational approach to organizational culture, design, and management. Ford's assembly line and Taylor's scientific management triggered off a chain of changes, some of which are still present in today's business world. Unfortunately, they did not only bring new formulae for gaining a much bigger profit, but also a lot of problems and undesirable side effects. Simple, meaningless tasks were not much of an inspiration for workers (Vidal, 2006). Strict rules, clearly defined roles and relationships inside organization killed every spur of joy and enthusiasm in employees (Vidal, 2006). On the other side, the technology developed at a great speed, and it was not possible any more to operate in a relaxed, cozy atmosphere where everyone worked as a big happy family. Companies expanded, they needed more complex organization, but bureaucracy just did not seem like the right answer to every problem. The socio-technical design offered new solutions. This concept was not developed only to assure that employees earn their living in a more pleasant environment, but also because researchers, such as Elton Mayo, discovered human factor and became aware of its importance in the race for profit.

1.5 The Internet and the Social Media

The development of technology is especially to be thanked to for the profound changes in communication. Because of technological devices, today communication is much faster, and people can be easily reached anytime and anywhere. Social media are one way of communication which has been adopted in the last twenty years. Apart from standard concern about how media affects youth and quality of communication, there are papers like "The impact of social media on children, adolescents, and families" (O'Keeffe, Clarke-Pearson, et al., 2011), "The impact of social media on software engineering practices and tools" (Storey, Treude, van Deursen, and Cheng, 2010), "Learning 2.0: The impact of social media on learning in Europe" (Redecker, Ala-Mutka, and Punie, 2010) and many others which are investigating not only the relationship between social media and human functioning, but also they measure the strength of the impact social media have.

In many articles, social media is presented as a potentially very influencing marketing tool. This potential part is stressed because, as it seems, social media have not been explored enough and companies are still not fully aware of all the possibilities that lay in this area. As Kaplan and Haenlein state (A. M. Kaplan and Haenlein, 2010), managers and marketers still do not

Figure 1.1: Social Media and Big Data (Online Marketing Blog—TopRank, 2013)



understand the concept of social media and have only vague ideas what it really is. This is quite concerning, because if there is a need to determine the role of social media, how can it be done without a clear idea about what these words stand for?

Authors of the article “Social media: The new hybrid element of the promotion mix” (Mangold and Faulds, 2009) explicitly say that social media should be used as part of the promotion mix. It seems like there is no more need to stress specifically potential of this new medium. Companies are expected to use the existing social applications or even create their own (A. M. Kaplan and Haenlein, 2010). This way of communication with customers became necessary.

A year ago, businesses were uncertain about social media. Now it's here to

stay and companies are rapidly adopting social media marketing. Much like email and websites first empowered businesses, social media is the next marketing wave. (Neti, 2011)

So many people are shifting towards Internet as their only medium of gathering information that it is a luxury to lose such a big part of the target market. Not only do people use Internet to stay informed or to amuse themselves, but also Internet retailers are becoming more and more popular (Brynjolfsson and Smith, 2000) and there is even a threat that at some point in time, Internet retailers will completely overtake the market. Throughout the articles, this same tendency of predicting the Internet's future popularity can be observed. Apparently, there is both fear and hope that the Internet will become number one medium. If this happens, knowledge about the Internet marketing will be not just very valuable, but also necessary.

Another fact which is highlighted and currently repeated is that social media became an integral part of the purchasing decision process (Kietzmann, Hermkens, McCarthy, and Silvestre, 2011). People rely on information which they find on blogs, forums, or read on Facebook or Twitter. Somehow, social networks became new word-of-mouth marketing (Trusov, Bucklin, and Pauwels, 2008). For that reason, there is an increasing demand for infiltration into social networks, and not just by creating ads. Articles are overwhelmed with advice on how to create a relationship with customers over social media. Some of the advice is: use blogs to monitor visitor attitudes towards the topic of interest (Lim, Chung, and Weaver, 2012), build virtual presence (Lim et al., 2012), use social media to build company's and product's identity (Neti, 2011), reach completely new groups of target customers (Neti, 2011), give the opportunity to the customers to leave feedback and make sure that you answer them (Neti, 2011), carefully choose social media applications which will serve the purpose (A. M. Kaplan and Haenlein, 2010), make company's applications easily accessible for everyone and especially interesting for target market (A. M. Kaplan and Haenlein, 2010), be honest with customers (A. M. Kaplan and Haenlein, 2010). This advice is based on previous experience of companies which have already adopted new marketing trend, but they are also a product of carefully conducted researches in this area.

Chapter 2

Methodology

2.1 Introductory Remarks

The expansion of the digital world brought numerous changes, many of which are yet to come. The transformation of the business world and the impact the Internet has on it can hardly be exaggerated. One of the greatest challenges which has been brought by the Internet is the sharp increase in the quantity of data available and necessary to process. While certainly it is a great advantage in comparison with the pre-internet era when the data was scarce and exclusive, today exclusivity means not to have the data, but to handle it properly and efficiently. Furthermore, storing the data available represents another great challenge. Cloud computing, for now, is one of the most successful answers for this problem.

While technological development took many different forms and has resulted in extremely diversified final products, this thesis will focus only on two of them—cloud computing and big data. These two terms have been widely discussed and related to many different constructs. In this thesis, competitive advantage is the third construct which will be introduced. This work is oriented towards uncovering ways in which cloud computing and big data influences achieving competitive advantage (and whether they make it harder or easier to achieve it).

2.2 Research Questions

The main research questions may be summarized as:

1. How does cloud computing transform business?
2. How does cloud computing influence competitive advantage of companies?
3. What kind of effect does big data have on business—positive or negative?
4. In light of the emergence of big data, what options are available to companies regarding their competitive advantage?

These research questions will be assessed through different thesis chapters. In order to make the flow of the thesis logical and easy to understand, first part of the thesis will be dedicated to cloud computing, second part to big data, third part to competitive advantage, and fourth part to practical examples of connection between cloud computing, big data and competitive advantage.

2.3 Hypotheses

Based on the research questions, following hypotheses are formulated:

1. Cloud computing has an impact on a company's flexibility, productivity, and financial efficacy;
2. Cloud computing is mostly a beneficial innovation, although it is expected that the impact it has is complex and cannot be exclusively attributed as good or bad;
3. Big data represents a powerful source of information and a basis for competitive advantage both in an industry and market;
4. Both big data and cloud computing can be used for achieving competitive advantage only if they are properly handled and exploited.

2.4 Research Objective

The main objective of this research is to summarize the existing knowledge about cloud computing and big data and the impact they have on business and, in particular, competitive advantage and to, if there is room for that, highlight a new way of understanding this relationship.

2.5 Research Methods

Qualitative research approach refers to the qualitative data being used in the research. The inductive approach goes along with the qualitative data. Qualitative data is considered to be more difficult for analyzing (Mark NK Saunders, Saunders, Lewis, and Thornhill, 2011). The two major approaches important for this research are induction and deduction (Mark NK Saunders et al., 2011). The deductive research approach is used, when it is required to develop a hypothesis or idea from existing theory that could be further tested through data collection. In comparison with the deductive approach, the inductive approach adopts a more flexible structure. It allows the researcher to make needed modifications to research, as it progresses (Mark NK Saunders et al., 2011). It is observed that induction starts with theories and broad suppositions that allow the researcher to test their implications systematically. Inductive approach helps in building explanations from the ground up, based on the research goal.

Methodology of this research is in accordance with the objectives of the research—to fuse data about topics of interest and to evaluate them. For this paper, the qualitative approach has been selected as the most appropriate one.

Literature review methodology will be used because of its significance in getting knowledge in depth as literature review technique is a mean to break down a whole into its tiniest parts and roots from which it has been evolving (Schwandt, Lincoln, and Guba, 2007) means to know about the inception of current strategies it is needed to have knowledge about previous ones, that can be known through literature review.

Through literature review, researchers get a complete picture of what has been done before, how these all have emerged and what is the relationship between current and past strategies (Onwuegbuzie, Johnson, and Collins, 2009).

There are two forms that would be taken to analyze literature review of this research conducted: within-study literature analysis and between-study literature analysis (Onwuegbuzie et al., 2009). Within-study literature analysis takes into account different components of work within a single study, including title, conceptual framework, procedure, results and discussion sections. This is needed to get as much information as possible. Between-study literature analysis is used to compare the results and findings from more than two resources of information. The most common practice is to compare results of empirical works and their every component.

2.6 Data Selection Process

In the process of finding secondary data, different tools will be used: Google—used for finding non-academic materials such as newspaper articles and company reports, Google Scholar—used for finding academic articles, and JSTOR, also used for finding academic articles. Several criteria will be adopted before the final corpus of articles is chosen. First, articles will be chosen based on their relevance with regard to the subject of this paper. Also, when it comes to academic sources, their relevance will be checked by the number of times they were cited. When the choice has to be made between two articles on the same subject, priority will be given to the one which was more cited by other authors. Year of the publishing will be also taken into account—majority of articles date from the period after the year 1990. However, capital works of the authors relevant for this subject will be included in the research, although, in the cases when there are two articles covering the same subject, priority will be given to the newer one.

Once when the articles are chosen, tertiary sources may be also used—references found in the selected articles are checked, and those articles which seem to be appropriate for the topic are also included into the corpus of articles used for the further analysis.

Chapter 3

Cloud Computing

3.1 Defining Cloud Computing

The term *cloud* is today widely used in order to stress how easily data can be reached and manipulated. It became a synonym-of-a-kind for availability, speed and easiness of managing the data. In order to continue further discussion about cloud hosting, it is necessary to define it first. According to National Institute of Standards and Technology (NIST), cloud computing is defined as:

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models. (csrc.nist.gov, 2015)

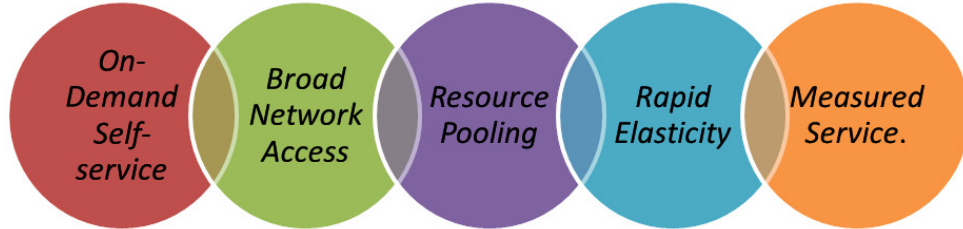
3.2 Main Characteristics of Cloud Computing

According to NIST there are five essential characteristics of cloud computing (nist.gov, 2015):

1. On-demand self-service;
2. Broad network access;
3. Resource pooling;

4. Rapid elasticity;
5. Measured service.

Figure 3.1: Essential Characteristics of Cloud Computing (blogs.technet.com, 2015)



On-demand self-service refers to the fact that *the required computer services can be used without the need to contact the provider. A user can access them any time he/she needs to* (csrc.nist.gov, 2015).

Broad network access refers to the fact that *capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms* (csrc.nist.gov, 2015).

Resource pooling refers to the fact that *the provider's computing resources are pooled together to serve multiple consumers using multiple-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand* (csrc.nist.gov, 2015).

Rapid elasticity is another important characteristic of cloud computing. It means that *cloud services can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time* (csrc.nist.gov, 2015).

The last characteristic outlined by NIST is measured service. *Cloud computing resource usage can be measured, controlled, and reported providing transparency for both the provider and consumer of the utilized service. Cloud computing services use a metering capability which enables to control and optimize resource use.* (csrc.nist.gov, 2015)

During the time, a sixth essential characteristic has been crystallized. Cloud Security Alliance firmly stands behind its opinion that multi tenacity should

be added to this list. This characteristic is defined as *the need for policy-driven enforcement, segmentation, isolation, governance, service levels, and chargeback/billing models for different consumer constituencies. Consumers might utilize a public cloud provider's service offerings or actually be from the same organization, such as different business units rather than distinct organizational entities, but would still share infrastructure* (isaca.org, 2015).

3.3 Cloud Computing Service Models

NIST three different service models (csrc.nist.gov, 2015):

1. **Software as a Service (SaaS):** *The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.*
2. **Platform as a Service (PaaS):** *The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.'*
3. **Infrastructure as a Service (IaaS):** *The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).*

3.4 Cloud Computing Applications

Many people are not even aware of the fact that they are using cloud computing. While they may be unfamiliar with the term, they are certainly familiar with some of its numerous benefits. Examples of cloud computing applications include (jhbarnes.net, 2015):

1. Customer Relationship Management (CRM) Applications;
2. Business Contact Management (BCM) Applications;
3. E-mail and Instant Messaging (IM) Applications;
4. Business Accounting Systems;
5. Office Productivity Applications;
6. Google Apps;
7. Line-of-Business Applications;
8. Online Storage Management;
9. Communications and Collaboration Applications;
10. Medical Imaging and Urgent Care.

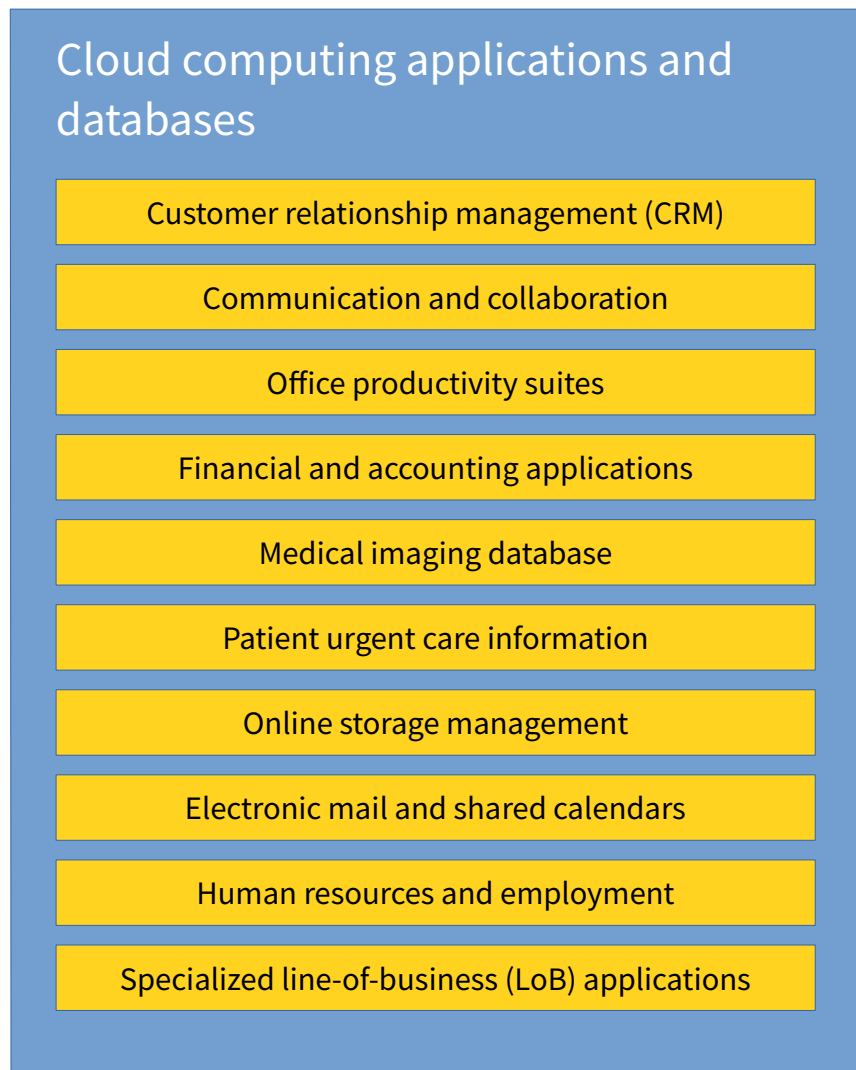
The number of cloud computing applications is rapidly growing (Ali and Miraz, 2013). Some authors believe that one of the reasons for this trend is a sharp increase in number of mobile users and development of 3G and 4G (Ali and Miraz, 2013). The attention is also brought to the fact that this type of applications is still far less popular in comparison with the expected number of mobile users who would embrace this technology (Ali and Miraz, 2013). One of the potential factors is the fact that majority of these applications requires data about user's location and many people do not feel comfortable with that (Ali and Miraz, 2013).

3.5 Forms of Cloud Computing

Cloud computing exists in three different forms:

1. **Private cloud**, defined as a *particular model of cloud computing that involves a distinct and secure cloud-based environment in which only the specified client can operate. Under the private cloud model, the*

Figure 3.2: Cloud Computing Applications (jhbarnes.net, 2015)



cloud (the pool of resource) is only accessible by a single organization providing that organization with greater control and privacy (Interoute, 2015b).

2. **Public cloud**, defined as a model, under which cloud services are provided in a virtualized environment, constructed using pooled shared physical resources, and accessible over a public network such as the Internet. Public clouds, however, provide services to multiple clients using

the same shared infrastructure (Interoute, 2015c).

3. **Hybrid cloud**, defined as *an integrated cloud service utilizing both private and public clouds to perform distinct functions within the same organization* (Interoute, 2015a).

Each of these forms of cloud computing has its own advantages and disadvantages. Without deeper knowledge about business requirements, market demands, etc. it is hard to say which one of these represents the best solution. Like in everything else, companies are seeking cost-efficient solutions which would suit their needs and help them reach commercial goals.

When it is talked about public models of cloud computing, following characteristics have been identified as the most beneficial ones: ultimate scalability, cost effective, utility style costing, reliability, flexibility, and location independence (Interoute, 2015c). This type of cloud computing has a great advantage because it ensures that changes are reflected in applications activity (ultimate scalability). They also offer huge amounts of data at lower prices (cost effective) and users pay for the resources only when they use it (utility style costing). These clouds can be accessed from literally any location (location independence), numerous services are available (flexibility), and the infrastructure does not let users notice that one of the elements is not working properly (reliability).

Interoute identified following characteristics as the greatest advantages of private clouds (Interoute, 2015b):

1. **Higher security and privacy:** *private clouds—using techniques such as distinct pools of resources with access restricted to connections made from behind one organization’s firewall, dedicated leased lines and/or on-site internal hosting—can ensure that operations are kept out of the reach of prying eyes;*
2. **More control:** *as a private cloud is only accessible by a single organization, that organization will have the ability to configure and manage it in line with their needs to achieve a tailored network solution;*
3. **Cost and energy efficiency:** *implementing a private cloud model can improve the allocation of resources within an organization by ensuring that the availability of resources to individual departments/business functions can directly and flexibly respond to their demand;*
4. **Improved reliability:** *even where resources (servers, networks, etc.) are hosted internally, the creation of virtualized operating environments*

means that the network is more resilient to individual failures across the physical infrastructure;

5. **Cloud bursting:** *this service allows the provider to switch certain non-sensitive functions to a public cloud to free up more space in the private cloud for the sensitive functions that require it. Private clouds can even be integrated with public cloud services to form hybrid clouds where non-sensitive functions are always allocated to the public cloud to maximize the efficiencies on offer.*

Finally, hybrid cloud, as its name suggests, represents a mixture of the previously described models. The features and advantages which it can offer to its users are a combination of the advantages of the two basic models and these include: scalability, cost efficiencies, security, and flexibility (Interoute, 2015a). If a company decides to pursue this option, there are several ways in which a hybrid cloud can be implemented (Interoute, 2015a):

1. *Separate cloud providers team up to provide both private and public services as an integrated service;*
2. *Individual cloud providers offer a complete hybrid package;*
3. *Organizations who manage their private clouds themselves sign up to a public cloud service which they then integrate into their infrastructure.*

As it has been already pointed out, choice of the cloud model depends on the nature of the business, its needs, types of data it deals with, etc. Choosing the right cloud computing model can be a very important decision and careful planning and assessment of company's current position is highly recommended.

Chapter 4

Cloud Strategy

4.1 Where to Start

The very first step in implementing cloud technology is creating an appropriate strategy. As the experience of many successful companies show, simple solutions may yield excellent and extraordinary results. It is important that during the process of creating a strategy one always has in mind the business's needs and requirements, as well as market needs (Orosco, 2013).

In general, strategy is defined as a *long term plan of action designed to achieve a particular goal or set of goals or objectives. Strategy is management's game plan for strengthening the performance of the enterprise. It states how business should be conducted to achieve the desired goals* (rapid-business-intelligence-success.com, 2015).

An effective cloud strategy can take various forms, but the essence is that implementation of the new technology is beneficial to the company. These benefits can also appear in different forms, but they have one thing in common—they add value for the company. This means that before implementation of a cloud technology, there should be a plan to do that in such way that it enables company to reduce its cost, while at the same time it contributes to the business' efficiency and profitability. Finally, the implementation should result in company's increased flexibility, which is today one of the main requirements in the business world.

4.2 Factors Which Businesses Need to Take into Account Before Making a Decision about Cloud Computing

The first step in process of choosing the right cloud hosting package is making sure that company has deep knowledge of what the business requirements are and what the real scope of a business is; a wrong estimate at the very beginning can cost dearly in the future.

Data needs to be evaluated carefully—it is very important to know what kind of risk a company is undertaking; for certain kinds of data, such as those which are confidential, cloud hosting is not the best solution; also, if there are too many pieces of data, this option should be re-thought.

Taking into account all possible costs, such as downtime, maintenance, upgrade and internal resources—this is the only way to know the exact amount of money which is going to be spent on introducing cloud hosting; although it is quite affordable, it is still not an insignificant amount of money which needs to be spent.

Careful evaluation of both commercial and operational benefits of introducing cloud hosting is another factor which needs considering.

Finally, broadening the perspective and taking into account future needs of a business, possible future partnerships, and all external and internal factors which can influence the course of a business.

4.3 Essential Steps in Creating Cloud Strategy

One of the main rules of strategic planning is that before any planning, a company must know its current position in the area of interest. In this case, it means that before turning to cloud computing, an enterprise should catalog all the applications it is currently using. This insight into the IT aspect of the company may set a solid basis for its further upgrade. Often, companies realize that they are using technology and its products more than they are aware of. Apart from the fact that assessing the current situation is a necessity, it may bring a bit of encouragement to the management once they realize that the company already relies on technology more than they imagined.

Once the applications are listed, a more focused approach to them should

be applied. While knowing the list of applications surely is important, it is even more important what each of these applications does for the company. The easiest way to that is to decide which of these applications are core and which are contextual. Core application is defined as an application which *creates sustainable differentiation in the target market resulting in premium prices or increased volume; provides true innovation and differentiation; seeks to dramatically outperform all competitors* (Orosco, 2013).

On the other hand, contextual application is defined as an application which *does not differentiate the company; seeks to meet, but not exceed, accepted standards* (Orosco, 2013).

Once the applications are listed and classified, the next step is determining their life cycle stage. This process should apply to other assets as well. When it comes to applications, they have a specific life cycle which consists of the following phases (technet.microsoft.com, 2015): packaging, management, deployment, updates, support, and termination.

This kind of assessment results in a clear overview of which applications should be updated and which will be no longer of use. It is a general rule that those applications which are in an update phase should be considered as candidates for the implementation of the cloud computing.

Furthermore, it is a must to employ a more sophisticated method of assessment—a technical analysis. The reason for its appliance is determining what can and what cannot be moved to the cloud. According to (Orosco, 2013), technical analysis should include following elements:

1. Level of customization;
2. Amount of intellectual property;
3. The number of integration points;
4. Network connectivity requirements;
5. Security requirements.

Financial analysis is the next step. As in every business, profitability is one of the key elements. Implementation of cloud computing should be more cost-efficient than the case in which company runs the infrastructure by itself. For the financial analysis to be successful, it is necessary to approach the problem from multiple angles. Academics agree that cloud computing certainly aims to reduce costs of IT while decreasing processing time and increasing company's flexibility (Low, Chen, and Wu, 2011). However, there are still debates

Figure 4.1: Application Life cycle (technet.microsoft.com, 2015)



whether this has been accomplished in practice (Low et al., 2011).

Without any doubt, cloud computing reduces the costs of independent IT management inside the company (Low et al., 2011). However, cloud computing may represent a significant investment and in the existing literature the high price is often stated as a major reason for postponing implementation of cloud system (Teo, Srivastava, and Jiang, 2008). Due to already mentioned globalization and technology market expansion, many providers of services related to cloud computing found themselves in a position that they had to lower the prices in order to stay competitive (The Economist, 2015). As a

result, this situation with cloud computing changed since the article by Low, Chen and Wu was published. Prices of cloud computing are significantly lower, and they are still falling.

Despite the current situation, a thorough financial analysis is still required. Orosco, 2013 suggests that following direct costs should be also included:

1. Staff;
2. Data-center real estate;
3. Cooling;
4. Power;
5. Software costs;
6. Maintenance;
7. Support.

Once when all of the previous steps are completed, two most important factors must be evaluated—cost of cloud implementation and value of cloud implementation. Person(s) in charge should keep in mind that the use of cloud should contribute to the business' efficiency, flexibility, and profitability and not simply replace the previous form of technology.

Orosco, 2013 points out that is not a rare case that managers overlook the ways in which cloud computing can transform business. Cloud computing offers a new way of doing the business and it leaves space for a contextual application to become a core one. The importance of this possibility is huge—it is a chance for a business to apply differentiation strategy.

The last, but not the least important step, is sharing the ideas and facts with other IT personnel. It is highly unlikely that one person will come up with a better-detailed solution than a team of professionals. The strategy should be tested carefully before it had been approved.

Chapter 5

Transformation of Business Influenced by Cloud Computing

Today, it is no longer a question whether cloud saves time and money, but how it can change business processes in addition. Currently, 37% of small businesses on American soil uses cloud technology, and the predictions are that this number will rise to 80% in the course of the next six years.

The transformational power of cloud technology has still not been exploited. It seems that, for now, cost reduction and improvement of efficiency are in the focus, but many experts point out that cloud is slowly changing business organizations, and its impact will only increase with years.

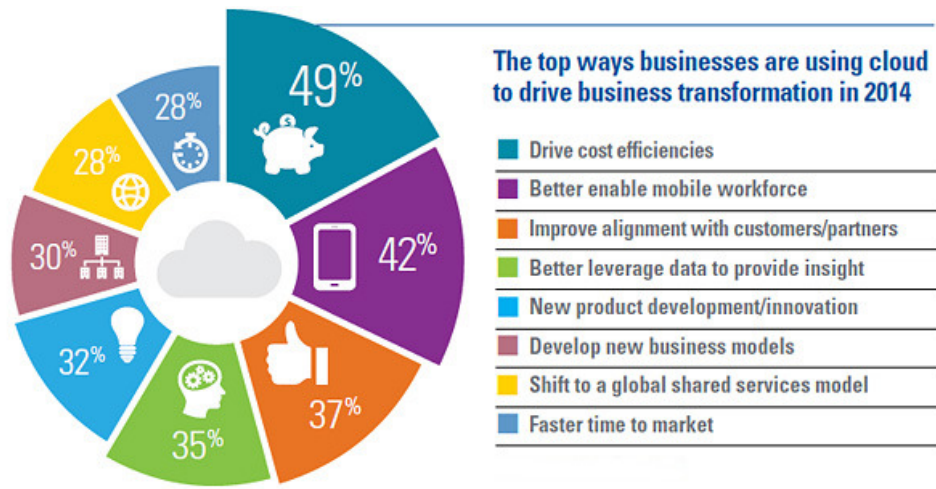
5.1 Benefits of Cloud Computing

Cloud technology has different applications when it comes to business transformation. A research undertaken by KPMG showed that companies started to use the cloud in order to drive business transformation, and these ways are (kpmg.com, 2015):

1. Drive cost efficiencies;
2. Better enable mobile workforce;
3. Improve alignment with customers/partners;

4. Better leverage data to provide insight;
5. New product development/innovation;
6. Develop new business models;
7. Shift to a global shared services model;
8. Faster time to market.

Figure 5.1: Cloud Technology and Business Transformation Forms (kpmg.com, 2015)



5.2 Workforce Mobility

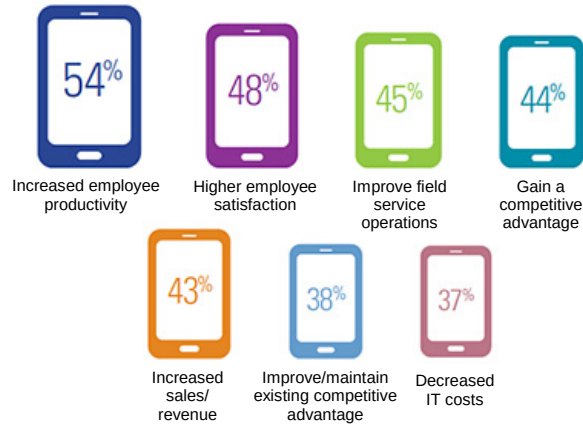
In the same research conducted by KPMG, it is uncovered that cloud technology increases workforce mobility, to the satisfaction of both employers and employees (kpmg.com, 2015). As it is explained, technology development contributed to higher expectations when it comes to richness of applications (kpmg.com, 2015). The experience from personal life has been transferred to an organizational setting. Cloud technology actually enables companies to provide their employees with rich visual experience from different destinations and at different points in time. The already mentioned consequences are higher productivity (54%) and higher levels of satisfaction and flexibility (48%) (kpmg.com, 2015).

Employee mobility is a source of many advantages. In the flexible and fast-changing environment flexibility enables companies to respond faster to the market demands and, in some cases, to anticipate them. Academic research showed that the flexibility of human resources is connected with a financial performance of the company, but that it is the skill flexibility which contributes most to the cost-efficient conduct of work (Bhattacharya, Gibson, and Doty, 2005).

Research conducted on corporations and business enterprises shows that following benefits can be highlighted as advantages of workforce mobility (KPMG, 2014):

1. Increased employee productivity;
2. Higher employee satisfaction;
3. Improved field service operations;
4. Competitive advantage;
5. Increased sales/revenue;
6. Improve/maintain existing competitive advantage;
7. Decreased IT costs.

Figure 5.2: Benefits of Workforce Mobility (KPMG, 2014)



5.3 Compatibility with New Working Arrangements

Employment of cloud technology enhances workforce mobility in another sense—remote working arrangements (Media Business, 2015). One of the trends in the labor market is that there is a growing number of non-traditional contracts. These include flexible working time, possibility to work from home, special arrangements for parents or caretakers, etc. (gov.uk, 2015). This kind of flexibility allows not only permanent workers to access the necessary data whenever and wherever it is necessary, but it also opens an opportunity for company to employ people who were not able to fit into the standard working schemes and therefore, cloud enables companies to choose from a much greater pool of potential employees.

5.4 Optimization of Business Processes

Prior to cloud technology, business processes were fragmented, and there was insufficient integration between business processes and data management (Cognizant, 2014). Once when the cloud technology became an important part of the business environment, it allowed companies to change their processes and create a more integrated and flexible organizations (Cognizant, 2014). Processes became more compatible, and managed at the organizational level. They also became more susceptible to changes, which enabled companies to respond faster to the changes in demand (Cognizant, 2014).

Business processes now tend to be mobile in their nature, and they are equally adaptable to the local and global environment (Cognizant, 2014). Furthermore, there is a change in the core of organizations—attitude towards the main principle of working. Cloud technology enabled organizations to put transformation as a core value and to constantly work on it (Cognizant, 2014).

5.5 Business Innovation

While innovation has always been one of the highest qualities in the business world, cloud technology enabled its complete expansion and turned into a necessity and not a competitive advantage (Cognizant, 2014). Infrastructure can now be constantly compatible with the market demand in comparison

with the pre-cloud period when it had to be adjusted from time to time (Cognizant, 2014).

Another aspect of cloud technology which allows for a greater degree of innovation is a more efficient use of applications and infrastructure (Cognizant, 2014). This ensures that resources and activities are distributed in a less time-consuming manner (Cognizant, 2014).

5.6 Rationalization of Application Platforms

In this domain, contribution of cloud computing is reflected in the following characteristics (Cognizant, 2014):

1. Decrease in costs and amount of time in terms of addressing scalability requirements;
2. Shorter period of application of changes;
3. Shorter period necessary to penetrate the market;
4. Decrease in IT infrastructure investment;
5. Decrease in IT management and maintenance costs;
6. Smaller risk exposure.

5.7 Plug-In Players

Plug-in-players is a term which was coined in order to define enterprises which plug into cloud-based service providers (inc.com, 2015). The purpose of the existence of such companies is to ensure that small businesses can focus on their core activities while the daunting ones can be left to somebody else to complete (inc.com, 2015).

5.8 Task-Oriented Teams

Task-oriented teams are having their share of popularity over the last few years. These teams are formed when it is necessary to complete a certain task or to pursue a project. Once when the common goal is achieved, the team no

longer exists. This kind of work is much easier once cloud technology becomes available (inc.com, 2015). Now, team members do not have to be in the same city, country, or on the same continent. They can use cloud technology to help them achieve their goal successfully (inc.com, 2015).

Task-oriented teams have existed before cloud technology, but they are truly fulfilling their purpose only now. This is because companies, due to cloud technology, can choose the very best people for the project, without worrying about restrictions such as location and time zone difference (inc.com, 2015).

5.9 Higher Level of Competitiveness of Small Enterprises

Experts point out that cloud technology has opened many new opportunities, and one of the most important ones is the fact that small companies can compete with corporations (inc.com, 2015). This trend is mostly present in the services industry, but the possibilities for further expansion exist.

5.10 Freelancers

Finally, freelancers which have multiple streams of income can make use of cloud technology in order to manage them (inc.com, 2015). The already mentioned alternative working arrangements are partially connected to this point. People work several jobs at the same time, especially in cases when they do not have a traditional job with working hours from 9 to 5. Cloud technology offers them a fairly easy way to organize their work and to continuously track the progress (inc.com, 2015).

Chapter 6

Cloud Technology and Its Challenges

For the greatest part of this paper, cloud technology was discussed from the perspective of its advantages. However, cloud technology cannot be implemented without any effort. It has been already mentioned that cloud technology can cost a lot, depending on the scope of business which is being moved to the cloud. Although prices have fallen (and this trend continues), the amount of money necessary for implementing a cloud is far from being small. For that reason, and in order to ensure that the cloud truly contributes to the business' profitability, there are many factors to which attention should be paid.

6.1 Most Common Challenges

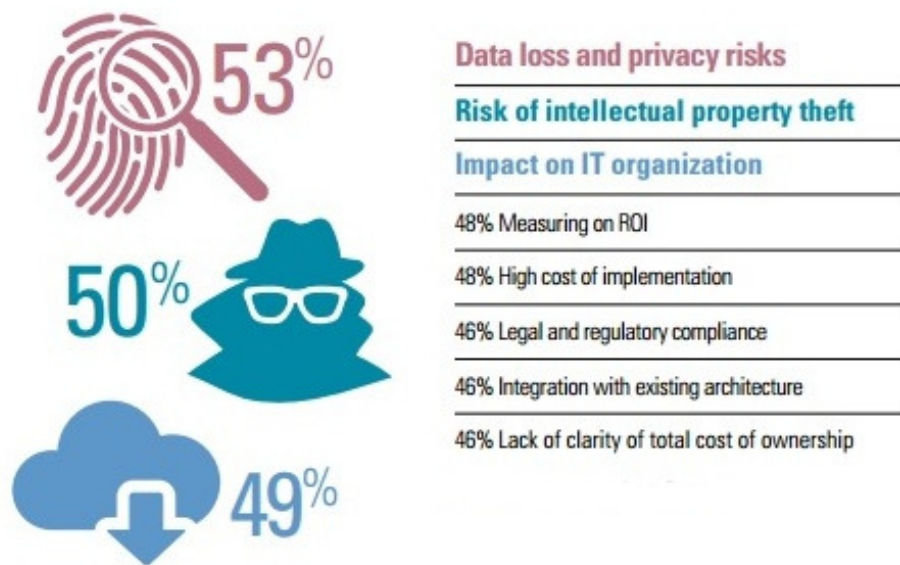
Companies which have already moved to the cloud are probably the best source of information about the problems with the initial phase of cloud implementation. Research conducted by KPMG uncovered that business leaders found these three challenges to be the hardest one (KPMG, 2014):

1. Data loss and privacy risks were highlighted by 53% of the respondents;
2. Intellectual property theft is seen as a great source of trouble by 50% of the respondents;
3. Impact on IT organization has been identified as a problem by 49% of the respondents.

These challenges are followed by (KPMG, 2014):

1. Measuring on ROI (return on investment);
2. High cost of implementation;
3. Legal and regulatory compliance;
4. Integration with existing architecture;
5. Lack of clarity of total cost of ownership.

Figure 6.1: Challenges of Implementing Cloud Technology (KPMG, 2014)



6.2 Lack of Appropriate Support

Lack of support has also been identified as one of the big challenges. When the strategy is not developed to its every last detail, problems of maintenance may stay unresolved (Cloud Tech News, 2015). This may lead to inconvenient situations once the company has already decided to switch to cloud technology (Cloud Tech News, 2015). In order to avoid this problem, it is necessary to make a decision whether a company will run a cloud of its own, or it will outsource this activity.

6.3 Low Quality of Service

The previously described challenge can be connected with quality of service which companies receive from cloud providers (ibm.com, 2015). Often, there are debates that the problems with functions of cloud system can cost dearly and that although there is a policy that providers compensate for the time lost due to server's inefficiency, executives state that it is not just the matter of money (ibm.com, 2015). Some of the surveys conducted highlight this as the main reason (together with the problem of data privacy) for companies not switching to cloud technology (ibm.com, 2015).

6.4 Lack of Compatibility with Business Needs

Cloud technology can underperform in cases when a company does not choose the suitable solution for its needs (Cloud Tech News, 2015). This especially applies to running the database server. Again, the problem lies in the process of planning and assessing a company's current and future position in the market. In order to choose the right solution, a company has to be in a position to anticipate the demand and potential qualitative and quantitative change in its needs. Cloud technology must add value to the company's performance and profitability, and it cannot be achieved if there is no compatibility between company's needs and characteristics offered by the chosen cloud. Hybrid Cloud System is one of the proposed solutions which reduces the risks for the company (Cloud Tech News, 2015). However, this should not be an excuse for insufficient strategic planning.

Chapter 7

Big Data

7.1 Definition

There have been debates about the definition of big data. Some experts believe that the term is too vague and that it does not offer practical implications. Other experts point out that the term is too subjective, especially when it is referred to the inability of the existing systems to handle big data. The term was first mentioned in a NASA paper published in 1997, when it was pointed out that big data poses enormous problems and challenges, especially in the field of visualization. A decade later, in 2008, the term was popularized and became widely recognized. Today, there are several definitions of big data, and none of them is accepted unconditionally. According to Oxford English Dictionary, big data is defined as:

Extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behavior and interactions. (oxforddictionaries.com, 2015)

Another definition is provided by Wikipedia:

Big data is an all-encompassing term for any collection of data sets so large and complex that it becomes difficult to process using on-hand data management tools or traditional data processing applications. (Wikipedia, 2015)

While in most cases Wikipedia is not seen as a reliable source of information for any serious academic research, in this case, it is often quoted as the definition it offers is believed to catch the essence of big data.

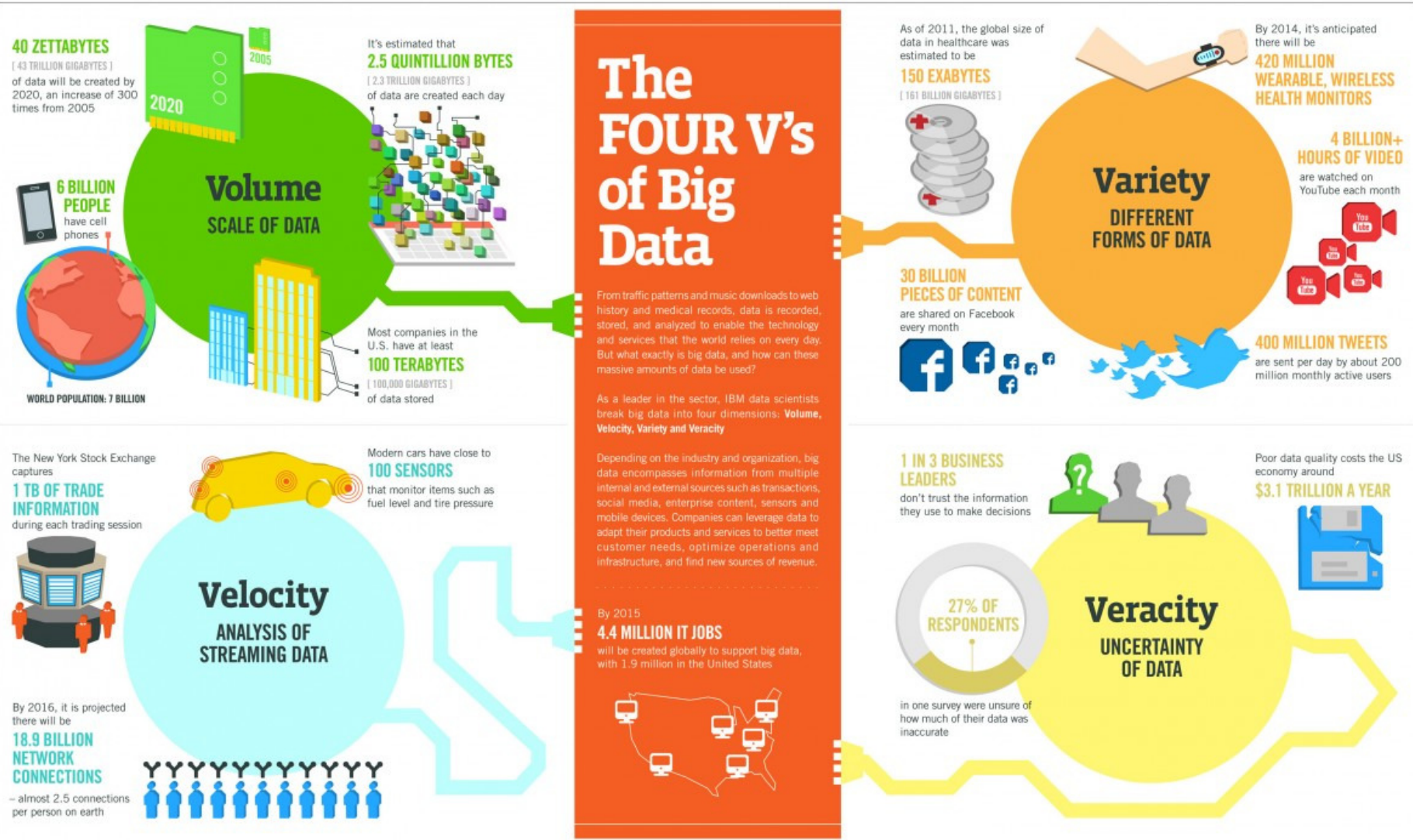
7.2 Four V's

In many articles about big data, there is a common phrase—*four V's of big data*. These four V's are the summary of the essential characteristics of the big data. The acronym stands for (ibmbigdatahub.com, 2015):

1. **Volume**, which refers to data quantity;
2. **Velocity**, which refers to *the pace at which data flows from sources like business processes, machines, networks and human interaction with things like social media sites, mobile devices, etc.* (Normandeau, 2013);
3. **Variety**, which refers to different sources and types of data;
4. **Veracity**, which refers to the *biases, noise and abnormality in data* (Normandeau, 2013).

It should be noted that, not that long time ago, there were three V's instead of four. While the majority of authors accepted the latest addition—veracity, some authors claim that even this is not enough. In order to describe big data as accurately as possible, there are three other characteristics which should be added. Mark van Rijmenam, the founder of Datafloq, claims that variability, visualization, and value should be recognized as important elements. Variability, as a characteristic of the big data, refers to the constant changes in meaning which happen over the time (Rijmenam, 2014). Rijmenam, 2014 marks the difference between variety and variability and highlights the importance of the latter. Visualization is, according to the author, also extremely important as it is a very powerful way of organizing data in such a way that it makes it comprehensible and easily understandable (Rijmenam, 2014). He believes that this may be one of the biggest challenges connected to the problem of big data. Finally, the author claims that describing big data without mentioning its value is, at least, incomplete (Rijmenam, 2014). Big data is extremely valuable to organizations and the society in general (Rijmenam, 2014). Of course, value is attributed to the pieces of information and knowledge stemming from big data sets, but they could not essentially exist without the raw data.

Figure 7.1: The Four V's of Big Data (ibmbigdatahub.com, 2015)



Sources: McKinsey Global Institute, Twitter, Cisco, Gartner, EMC, SAS, IBM, MEPTec, QAS



7.3 Structured and Unstructured Data

One of the common themes when discussing big data is data structure. In the light of this problem, two types of data can be highlighted: structured and unstructured data.

Structured data is defined as *data that resides in a fixed field within a record or file. This includes data contained in relational databases and spreadsheets* (webopedia.com, 2015a). Structured data is a preferred type of data in a sense that it can be easily stored as it fits into the pre-organized structures (webopedia.com, 2015a). Hence, the analysis of structured data is fairly easy, straightforward and relatively inexpensive (webopedia.com, 2015a).

In contrast, unstructured data is defined as *information that doesn't reside in a traditional row-column database. Unstructured data files often include text and multimedia content* (webopedia.com, 2015b). Unstructured data comes in many different forms, and it can include e-mail messages, word processing documents, videos, photos, audio files, presentations, webpages, etc. (webopedia.com, 2015b).

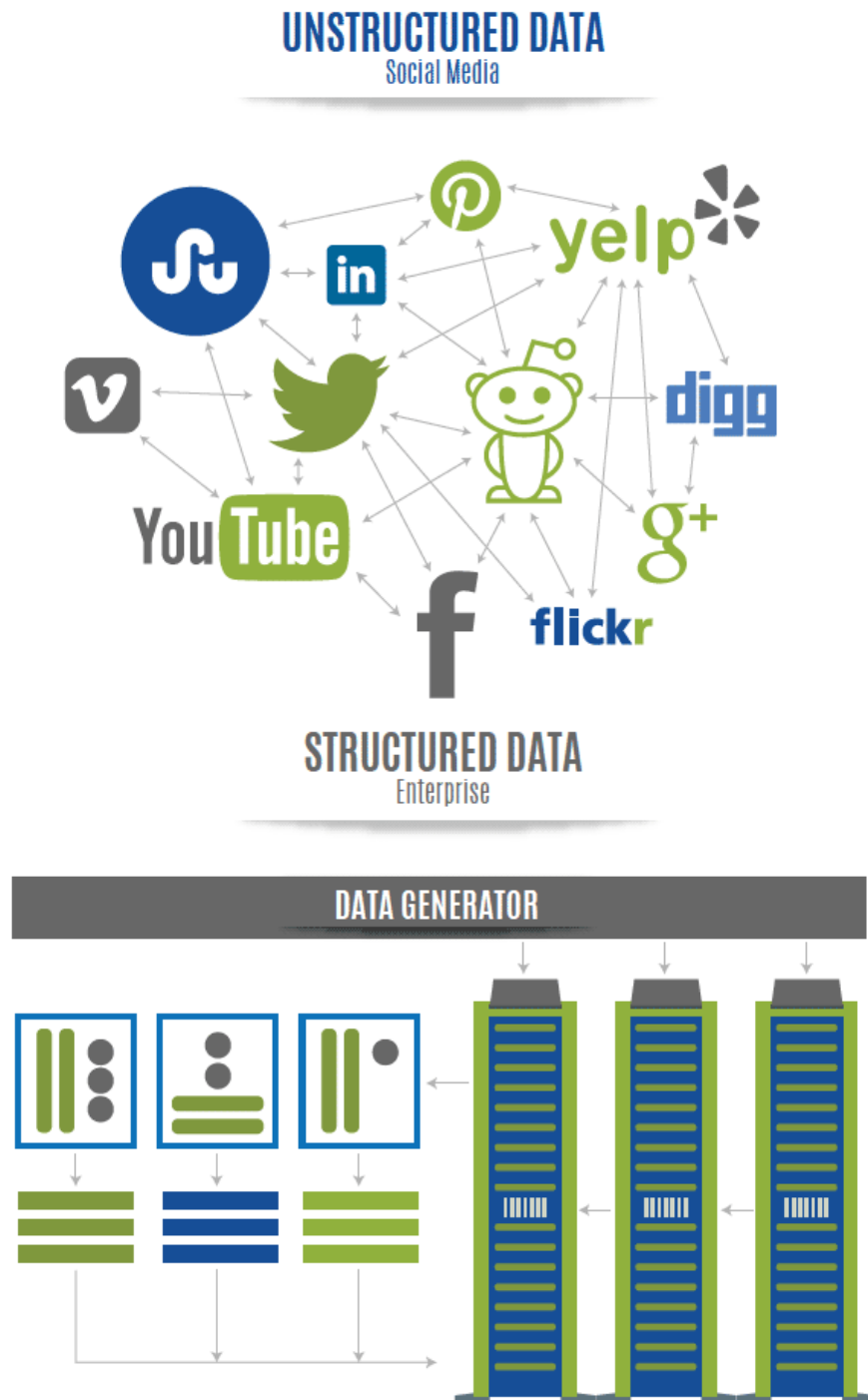
As the data becomes more and more complex, which is often discussed when talking about big data, another category has been introduced—multi-structured data—which refers to a *variety of data formats and types and can be derived from interactions between people and machines, such as web applications or social networks* (Arthur, 2013). The changes in communication which were noted in the introduction of this paper are one of the main contributors to the rise of unstructured and multi-structured data. Social media are seen as the essential source of these two types of data and as the number of users is growing daily, it is estimated that it will hold an even more important position in the world of big data (Arthur, 2013).

Importance of unstructured data in the context of this paper cannot be overemphasized. According to the opinion of experts, growth rate of unstructured data is 62% annually, which will eventually lead to the situation when 93% of all the data present is unstructured (it is predicted that this will happen by 2022) (Headwaters Group, 2015). The whole buzz about big data is quite justified when it is taken into account that data volume is expected to grow 800% during the period of only 5 years and the estimation is that 80% of the total amount will be unstructured (Headwaters Group, 2015). These facts are justification for the growing concerns about big data, because unstructured data poses problems for data mining, analysis, storage,

visualization, etc.

Gartner, one of the most eminent experts in this area, continuously stress that the problem with unstructured data does not lie in storage capacities, but that it requires intelligence, a different approach to the problem (Joseph, 2014). They also emphasize the value of unstructured data both in terms of risk value and business value (Joseph, 2014). Luckily, everybody shares the same problem. Some experts believe that it is reasonable to expect that the problems with unstructured data will be, at least partially, solved in the near future, as it is of great importance for all industries (Joseph, 2014).

Figure 7.2: Difference between Unstructured and Structured Data (smartdatacollective.com, 2015)



Chapter 8

Data Mining

8.1 Introductory Remarks

Discussion about big data cannot be complete without referring to data mining, as the two cannot exist one without other. As it can be seen in this chapter, data mining also progressed over the time and became more complex. Currently, there is debate over whether existing data mining techniques are sophisticated enough for mining unstructured data.

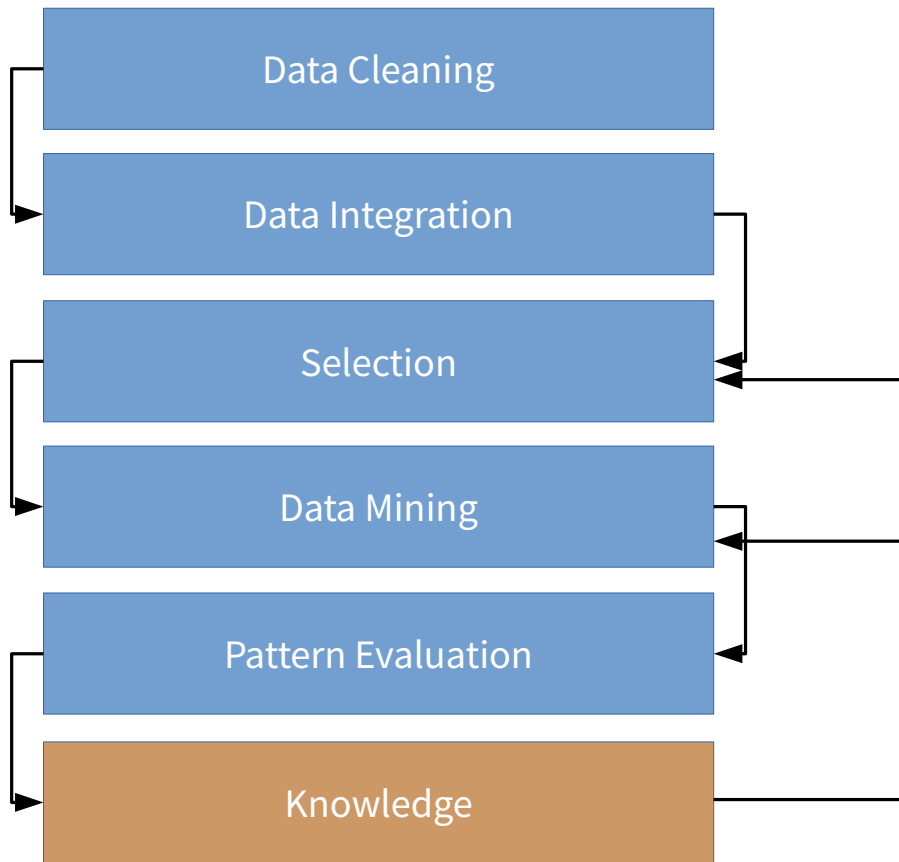
Some of the very beginnings of data mining can be found in statistics, artificial intelligence, and machine learning and database research. The name can be found in papers from the 1980s when it was first mentioned (Mikut and Reischl, 2011). In the early phases, there was mostly statistical analysis (in the 1950s), but over time a large number of tools developed in order to suit the preferences and needs of clients. According to the definition:

Data mining is a step in knowledge discovery from databases (KDD) process that consists of applying data analysis and discovery algorithms to produce a particular enumeration of patterns (or models) across data. (Mikut and Reischl, 2011)

KDD is defined as the *nontrivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data* (Mikut and Reischl, 2011).

At the moment, there is a vast number of standard data mining methods on the market. These methods have various origins. One can identify a

Figure 8.1: KDD Process (ijarcst.com, 2015)



cluster of methods which have roots in classical statistics—hypothesis testing was replaced with hypotheses generation (Mikut and Reischl, 2011). These methods are, among others, based on Bayesian decision theory, regression theory, and principal component analysis (Mikut and Reischl, 2011). Artificial intelligence was the foundation for another cluster of methods which encompasses decision trees, rule-based systems, etc. The widely used syntax machine learning encompasses a group of methods including support vector machines and artificial neural networks (Mikut and Reischl, 2011).

8.2 Data Mining, Market Demand, and Trends

Data mining methods have a very specific life cycle. It all starts with theoretical papers relying on in-house tool prototypes, which are later distributed to the market once the success of algorithms is proven (Mikut and Reischl, 2011). After that phase, there are two options. The first is to develop further similar algorithms, which, in the end, end up becoming a part of open-source packages (Mikut and Reischl, 2011). The second option is to fuse the new algorithms with currently present open-source or commercial packages (Mikut and Reischl, 2011). Numerous companies have tried to get their share of the market by promoting their own packages, but this is not an easy task, as a majority of them discovered. Some of the data mining tools last quite shortly in the market. This may be attributed to the internal marketing decisions, or the common practice of large companies to acquire small ones and once when the acquisition is completed, change the name of the product.

There are several stark examples of successful data mining tools and some of them are related to the widely known statistical packages. One of these examples is SPSS, a company which was started in 1975 and has been offering its products and maintaining large market share ever since (spss.com.hk, 2015). In the early phases, SPSS marketed statistical packages for mainframe computers. As the technology developed, these tools were adjusted and updated, and they became available in a form compatible with personal computers as well as for personalized servers of corporate clients (spss.com.hk, 2015). As artificial neural networks and decisions trees, representatives of data mining algorithms, were gaining their share of popularity, SPSS responded to the new market trend by acquiring companies like Integrated Solutions Ltd. (spss.com.hk, 2015). The reason behind this decision was to acquire a data mining tool called Clementine, among others. Later, this tool was renamed and became PASW Modeler, a name familiar to its current users. One of the latest acquisitions which was also reflected in the name of the tool was IBM, and today we have IBM SPSS Modeler (spss.com.hk, 2015). The company has managed to maintain its leadership position in the market, as its products widely used, especially for business and applied research purposes.

SPSS is, of course, far from being the only company which produces business intelligence products coupled with data mining tools. Another success story is Oracle, a company which expanded due to numerous acquisitions.

Open-source libraries also have been experiencing higher demand since the 1990s (cs.waikato.ac.nz, 2015). The best illustration of this statement is

Waikato Environment for Knowledge Analysis (WEKA). In the beginning, WEKA was a C++ library which became available to the wider audience in 1996 (cs.waikato.ac.nz, 2015). During 1999, it experienced a complete makeover and became a JAVA package (and it is updated on a regular basis). Furthermore, its components found their place in numerous open-source tools.

This expansion of the variety offered to customers does not come without drawbacks. Potential clients often find themselves in a position to make a choice for their business. Having in mind that this kind of decision is costly, it comes as no surprise that there is a slight concern whether the chosen package would suit the needs and justify the investment. One of the general suggestions is that criteria for data mining tool categorization can be used as guidelines for the decision-making process (Mikut and Reischl, 2011). Comparing main characteristics of different solutions may make it easier to spot the most relevant ones. Some of the criteria for comparing data mining tools are (Mikut and Reischl, 2011):

1. User groups;
2. Data structures;
3. Data mining tasks and techniques;
4. Import and export features;
5. License requirements.

8.3 Data Structures

Data structure has been already discussed in the previous chapter when it was noted that there are structured, unstructured, and multi-structured data. Now, the same problem will be explored in the light of data mining. It was also previously noted that unstructured data mining is more complex, so it is no surprise that at the beginning of data mining development the only solutions available were the ones which could process sets of data in the form of two-dimensional feature tables. This kind of data is still very relevant and used, and it is a basic form of data set with N , the number of examples, and S , the number of features of interest which are either real values or in a form of an integer (Mikut and Reischl, 2011).

Differently structured data can be described by same dimensionality (Mikut and Reischl, 2011). This is especially true for text mining when in most cases the frequency of words is measured. The most advanced type of this kind of structured data includes the time series, which means that the set can be described from one to three dimensions (Mikut and Reischl, 2011). Time series have a very important position, especially in the business environment, as it is used for predicting the stock markets, forecasting of energy consumption and other markets, and quality supervision in production (Mikut and Reischl, 2011). Because of its wide application, it is included in the majority of data mining tools.

Other types of structured data include gene sequences (spatial structure), spectrograms or mass spectrograms (structured by frequencies or masses), etc. (Mikut and Reischl, 2011). As these are more complicated in comparison with previous ones, not many data mining tools support these data formats.

One of the newest trends in the market are data mining tools for pictures and video clips. This trend, however, poses a serious challenge for providers of data mining solutions as these data sets are large in volume and have numerous dimensions (Mikut and Reischl, 2011). Medicine, biology, biometrics, security—these are some of the areas where these data mining tools found their application. Related to this, graph mining is also another area which is currently in expansion, although it is, for now, supported by very few tools including Pegasus and Proximity.

8.4 Categorization of Data Mining Tools into Different Types

8.4.1 Data mining suites (DMSs)

Data mining suites (DMSs) incorporate various techniques, and they are primarily used for data mining. They are characterized by components such as tables and time series, although in some cases other non-standard text mining tools can be featured (Mikut and Reischl, 2011). Unlike the business application, this one covers a wide range of fields. As the application is often used in a business environment, important export of models, reporting, and large numbers of diverse platforms are always featured (Mikut and Reischl, 2011). Additionally, manufacturers also supply different options for application modification in order to make it suitable for the concrete business

environment and customer. This application requires significant investments, but there are free-of-charge options such as RapidMiner.

8.4.2 Business intelligence packages (BIs)

Business intelligence packages (BIs) are not intended to have a certain area of expertise, but cover the basics of data mining with a stress on the application of statistics in the business environment (Mikut and Reischl, 2011). In many cases, these packages support only tables and time series, although they provide customers with large feature tables. These packages are believed to be highly functional and very useful in the training of the customer, as well as modifying it in order to fit the customer's needs. Database coupling is the central operation which can be undertaken with BIs (Mikut and Reischl, 2011). For those who want to use it, the process of installation is handled through a client/server architecture.

8.4.3 Mathematical packages (MATs)

Mathematical packages (MATs) are equipped with a great number of algorithms which can be further built upon. They are also rich with different visualization routines (Mikut and Reischl, 2011). Feature tables, time series and the possibility to upload pictures are some of the features of these packages. However, it is a bit complicated to use them as it is required that the user is equipped with programming skills. MATs are found to be appealing in areas such as algorithm development or applied research because these packages offer the possibility to implement algorithms at a very high speed, often as extensions or research prototypes. Some of these packages are intended for wide use, such as MATLAB or R-PLUS while some of them are free of charge, such as R, Kepler (Mikut and Reischl, 2011). Some think that Excel can be labeled as a mathematical package, but the topic is still being discussed (Mikut and Reischl, 2011).

8.4.4 Integration packages (INTs)

Integration packages (INTs) represent a mixture of various open-source algorithms (Mikut and Reischl, 2011). They can have a status of independent software, or they can be part of some other package such as MAT (Mikut and Reischl, 2011). These packages support import and export to and from

standardized formats, which is considered to be their advantage. However, their main disadvantage is that they do not offer good database support. The majority of the tools can be found on various platforms, and they incorporate a GUI. The combination of the models with a license and those which are free-of-charge always heavily relies on the tools used in the mathematical models (Mikut and Reischl, 2011). Such combination is appealing to the algorithm developers and applied research users as the package can be upgraded and quickly compared with alternatives. Additionally, these combinations can be later modified in order to incorporate advanced import tools and specific mining techniques.

8.4.5 EXT

EXT, in comparison with other packages, has small add-ons used for other packages such as Excel, Matlab, R, etc. (Mikut and Reischl, 2011). Its functionality is highly restricted, yet very powerful (Mikut and Reischl, 2011). Here, only a few data mining algorithms are implemented.

Chapter 9

Users Who Benefit from Data Mining and Big Data

9.1 User Groups

When it comes to data mining, several different user groups have been identified (Mikut and Reischl, 2011):

1. **Business applications:** this group of users seeks solutions which help them achieve their corporate and commercial goals. Some of the areas of their interest are customer relationship management, fraud detection, and staff information, etc. (Mikut and Reischl, 2011). In order to serve this group of users, the market mostly offers commercial tools appropriate for handling big data sets, and they are commonly aligned with the company's workflow.
2. **Applied research:** this group of users needs data mining in order to complete various research-related tasks. Data mining tools are needed by scientists and researchers with different academic backgrounds—they are equally useful to social scientists as to IT researchers (Mikut and Reischl, 2011). What these users seek are well-proven methods, user-friendly graphic interfaces and interfaces related to domain data formats and/or databases (Mikut and Reischl, 2011).
3. **Algorithm development:** users working on the development of new algorithms are mostly interested in tools which can handle several algorithms. Demands of this user group are very specific as they also require

tools which can integrate methods and compare them to the currently existing ones (Mikut and Reischl, 2011).

4. **Education:** This user group is mostly situated at various colleges. Tools developed for this market segment should be quite simple in terms of use, and they should have an interactive, user-friendly interface (Mikut and Reischl, 2011). Additionally, unlike with other groups, the price is here of great importance, and inexpensive solutions are preferred. An extra requirement is that the chosen solution should have a possibility of integrating in-house methods, especially for the purposes of programming seminars and training (Mikut and Reischl, 2011).

9.2 Government

Previously identified user groups of data mining presented by Mikut and Reischl also apply to big data. However, there is one more important user who is often mentioned when it is big data is discussed—the government and government agencies. Governments from different countries certainly have one thing in common—they need to deal with huge amounts of data. Not only that they are dealing with high data volume, but the data comes from diverse sources, and it is often real-time. In order to increase the efficiency in their work, governments had to turn to technological innovations in order to achieve their goals. IBM provided a list of four most important tasks of every government and how they can be handled. These tasks, together with the benefits of dealing with them in the light of big data are summarized as follows:

- **Threat prediction and prevention:**
 - More reliable understanding of a target or area of interest;
 - Finding relevant dots, connecting them, helping analysts understand what they don't know and keeping it up to date;
 - More effective use of analysts' time and focus;
 - Improved collaboration and faster response.
- **Social program fraud, waste, and errors:**
 - Reduced social benefit overpayments;
 - Proactively detected & deterred fraud and abuse;

- Reduced analysis time and improved efficiency;
- Improved program integrity and preservation of limited budgets for eligible citizens.
- **Tax compliance—fraud and abuse:**
 - Minimizing the tax gap;
 - Proactively detecting & deterring fraud and abuse;
 - Reducing analysis time;
 - Improving efficiency and save taxpayer dollars.
- **Crime prediction and prevention:**
 - Deeper understanding of persons of interest, crime and incident patterns, location-based threats, etc. in order to predict and prevent crime;
 - Improved case clearance rates;
 - Stronger inter- and intra-agency collaboration;
 - Faster, better-informed response.

9.3 Experience of Effective Big Data Users

As handling big data is far from being an easy task, there are a lot of online manuals and shared common wisdom which should help big data users to make the most of it. In contrary to general belief that advice regarding using technology follows certain steps, effective use of big data is all about being flexible (Bridgwater, 2014). Forbes published an article regarding this topic and the first advice given to future users is that they should be free of any expectations and fixed goals. The reasoning which lies behind this advice is that big data is so complex and full of potential surprises that any predetermined outcome may prevent one from getting an invaluable insight into the problem (Bridgwater, 2014).

Following this advice, users are encouraged to be proactive, pragmatic, progressive and persuasive:

The big data analyst has to be proactive and look for trends that nobody else has identified in their data. He or she has to be pragmatic about what is of

real value to the business—and then progressive in terms of trying to unearth insight over and above that which is immediately obvious in the data at hand. Finally, this person is persuasive i.e. they need to sell the value of that insight back to the board or the rest of the company. (Bridgwater, 2014)

Based on previous paragraphs, it is easy to understand why users are also advised to use big data even in the areas where it is not expected (Bridgwater, 2014). This means that apart from being creative while analyzing data, one should also be creative when it comes to putting it into use. And in order to use big data appropriately, it is necessary that those who are handling it can put it into the context. Remembering the whole context—the big picture—is one of the essential requirements for efficient use of the big data (Bridgwater, 2014).

Finally, while big data can be analyzed and used in different ways, it should be always taken into consideration in the right moment (Bridgwater, 2014). It has been already discussed in this paper that big data changes constantly. For that reason, the right moment should be chosen to use it and to enhance problem-solving and decision-making processes.

Chapter 10

Challenges of the Big Data

10.1 General Problems with Big Data

According to Cloud Security Alliance (CSA), the following challenges are the ones which are the most relevant to the problem of big data (cloudsecurityalliance.org, 2015):

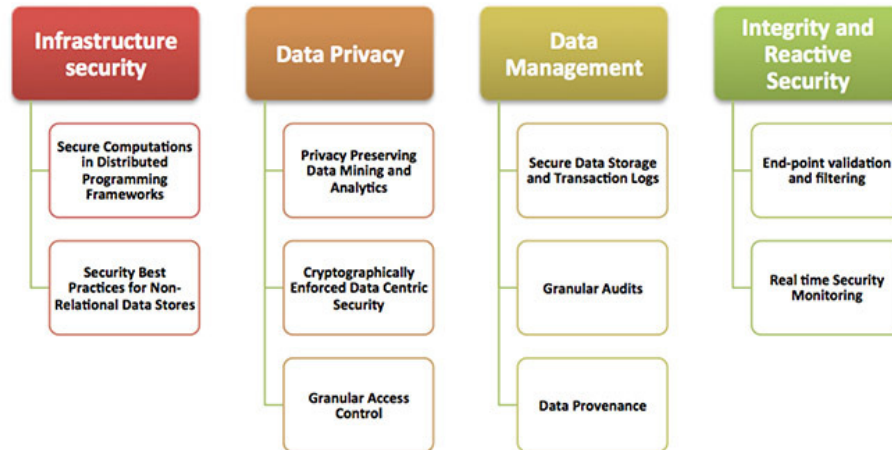
1. Secure computations in distributed programming frameworks;
2. Security best practices for non-relational data stores;
3. Secure data storage and transactions logs;
4. End-point input validation/filtering;
5. Real-Time security monitoring;
6. Scalable and composable privacy-preserving data mining and analytics;
7. Cryptographically enforced data-centric security;
8. Granular access control;
9. Granular audits.

“The Expanded Top 10 Big Data Challenges” has evolved from the initial list of challenges presented at CSA Congress to an expanded version that addresses three new distinct issues:

1. **Modeling**: formalizing a threat model that covers most of the cyber-attack or data-leakage scenarios;

2. **Analysis:** finding tractable solutions based on the threat model;
3. **Implementation:** implanting the solution in existing infrastructures.

Figure 10.1: Classification of Big Data Challenges (cloudsecurityalliance.org, 2015)



Another classification of challenges, offered by David Loshin, highlights the following five challenges (Loshin, 2015):

1. **Uncertainty of the data management landscape:** choice of the right tool for managing big data;
2. **The big data talent gap:** lack of experts dealing with big data;
3. **Getting data into the big data platform:** problem of data accessibility and integration;
4. **Synchronization across the data sources:** possibility of time lags which impact data currency and consistency;
5. **Getting useful information out of the big data platform:** problem of data syndication.

10.2 Visualization

Visualization is one of the biggest challenges connected with big data. SAS outlined four main challenges regarding visualization (sas.com, 2015):

1. **Meeting the need for speed:** as modern business environment fluctuates at a very high pace, it is necessary that companies act accordingly; visualization is one of the methods which makes decision making easier and faster, but when it comes to extremely high data volume, it may prove to be inefficient;
2. **Understanding the data:** visualization is a tool for simplifying important data elements, but it can fail in cases when there are too many dimensions, and visual presentation becomes too crowded and confusing if there is no appropriate system developed;
3. **Addressing data quality:** data accuracy and its timeliness are of great importance because decision is based on them; even when the first two problems with visualization are solved, it is of no use if data is not relevant;
4. **Displaying meaningful results:** one of the problems with big data in general is deciding which pieces of information are important and which are not; if too much information is displayed, then there is a great possibility that those who read it cannot understand it properly;
5. **Dealing with outliers:** outliers always exist in the data sets and presenting them in a visual way may shorten the time necessary for detecting a problem; it is a general case that 1 to 5% of the data falls into the category of outliers; in case of big data, even 1% stands for huge amount of data and those dealing with big data have troubles finding the right way to include outliers without unnecessary complicating the visual material.

Chapter 11

Competitive Advantage

11.1 General Competitive Advantage Theory

This theory represents an assessment of how intensely a country partakes in worldwide markets. Porter offers a jewel-molded outline to framework the system of four key variables that can adjust four fixings to get more focused. The four elements are (internationalrelationsonline.com, 2015):

1. Accessibility of assets;
2. The data utilized as a part of choosing which open doors to seek after for the organization;
3. The objectives of people in organizations;
4. The advancement and speculation weight on organizations.

Because of the importance of the theory, each of its elements will be briefly described.

Component conditions are general sets of components that make a country aggressive. These elements could be anything from human assets and material assets to the foundation and the nature of exploration at colleges (Hunt and Morgan, 1995). In spite of the fact that a country may have a wealth of component conditions (i.e. ease-work and lavish vegetation), the use of these elements is more critical than their insignificant presence. Moreover, when

a country fails to offer a component, they utilize advancement to make up for it, which normally prompts an expansion in NCA (Hunt and Morgan, 1995). Case in point, Japan is a little country that needs enough land fit for horticulture; with a specific end goal to make up for this and get more focused in the worldwide markets, nonetheless, Japan has misused its abundance of human assets to turn into a worldwide pioneer in engineering.

Demand conditions portray the home request of an item or administration having a place with a particular organization (Hunt and Morgan, 1995). Home request is controlled by various elements, which incorporate client needs and needs and an organization's ability and development rate, and in addition the apparatuses used to impart local inclination to remote markets (Hunt and Morgan, 1995). Interest conditions are essential because an NCA will emerge when household interest exceeds outside interest, since organizations have a tendency to commit more of a chance to creating items that are sought after mainly as opposed to abroad.

A country will have more NCA when its universally focused **supplying commercial ventures** are prosperous and lead to the flourishing of its connected and supporting businesses (Hunt and Morgan, 1995). The accomplishment of aggressive supplying businesses will advertise development and globalization of other nearly related commercial enterprises.

The **stronghold, association, and administration of neighborhood organizations** focus on provincial rivalry and prompts the variance of NCA (Hunt and Morgan, 1995). This is a subject on which numerous countries' organizations vary because of the social differences starting with one nation then onto the next. Organizations that are family-claimed or have a family-business structure will carry on uniquely in contrast to freely cited organizations regarding the matter of nearby and global rivalry (Hunt and Morgan, 1995). Besides, neighborhood competition is unfathomably worthwhile to NCA; this is on the grounds that high nearby contention goads advancement and change, and accordingly advertises a national preference.

11.2 Building Competitive Advantage through People

When competitive advantage is discussed, one of the common notions is that human capital of a company is actually its greatest strength and source of

competitive advantage. There are numerous academic papers dedicated to this line of thinking. Human capital has been discussed by and large and today it is no longer a question whether this is a source of competitive advantage, but how to use it in the best way possible. This creates a strong connection between constructs of competitive advantage and human resources management. For that reason, in this section, readers will be presented with self-leadership, servant leadership, and organizational culture, as some of the most frequently discussed sources of competitive advantage stemming from human capital.

11.3 Self-Leadership

Self-evaluation is essential for boosting one's confidence (Hill, 1994). Being a leader includes effective communication, standing up for yourself and your team, handling various problems, and exerting power when it is necessary, and while doing all of that, the leader is being watched and evaluated by colleagues (Hill, 1994). This assessment of the leader's skills can take different forms and obtaining data from colleagues, superiors, or some external body (R. S. Kaplan and Norton, 2001). There are even different questionnaires developed which help leaders in self-evaluating some of the most important skills, such as collaboration (Borden and Perkins, 1999).

The importance of self-evaluation when it comes to leaders has become a part of a broader concept called self-leadership (Manz, 1986). While the main elements of this concept are self-motivation and self-developed strategies, self-evaluation is one of the processes which is always present (Manz, 1986). Why is this important even for the organizations which have institutionalized the role of the leader? Because research showed that this kind of leadership is becoming one of the major forms of leadership adopted in organizations (Pearce and Manz, 2005) and one of the reasons lies in the fact that people who are capable of assessing their work are more productive and capable of dealing with complex situations in the work environment (Prussia, Anderson, and Manz, 1998).

Self-evaluation can be of great importance in cases when a leader is dealing with a complex situation or crisis (Cameron and Quinn, 2011). This process benefits both the leaders and those who are led. The leader achieves better insight in what he or she is doing, what should and can be done, and whether the right approach is adopted (Cameron and Quinn, 2011). Furthermore,

self-assessment represents one of the sources of intrinsic motivation (Shamir, House, and Arthur, 1993) and a motivated leader boost the spirits in the team and inspires the team members to give their best (Ilies, Judge, and Wagner, 2006).

Self-evaluation in a leadership context can be extremely important for one more reason. It was empirically tested and proven that people, in general, believe that their abilities, including leadership and social skills, are above average (Sedikides and Strube, 1997). This can be very harmful in the organizational context. Although self-confidence is a highly desirable trait of a leader (Kirkpatrick and Locke, 1991), it has to be based on one's real abilities, and not on a misconception thereof.

Self-evaluation can be important in the process of general assessment of leaders' abilities and results of their work, as there are those who believe that self-evaluation can be one of the major parameters used in the check-phase. This attitude is still under question because of the contradictory results obtained from research studies. Some of them found that self-evaluation results go into the same direction as the ones of supervisors, but there are still differences, especially when the leaders are aware of the fact that their work will be assessed (Gerstner and Day, 1997). It was found that leaders tend to be harsher on themselves when they know that their superiors will also assess their work (Gerstner and Day, 1997). Other research showed that leaders tend to perceive their accomplishments in smaller amounts than people around them and that, surprisingly, the least scores were obtained for technical skills (Moore and Rudd, 2005). There are even findings that results of self-evaluation are not consistent over time (Rohs, 1999). However, although the results are not consistent, there is still an urge to fully recognize the importance of self-evaluation in a leadership context, especially when it comes to the process of becoming a leader (Rohs, 1999). For leaders of all kinds, self-evaluation is seen as one of the major prerequisites for continuous advancement and development (Glasman, Cibulka, and Ashby, 2002).

11.4 Servant Leadership

Servant leadership is not a concept which was developed with the emergence of business science. The very idea about the leader who is at the same time perceived as a servant can be found in different books, myths and legends (Greenleaf and Spears, 2002). A long time ago it was recognized that some

people had the power to influence others without actually exercising power in the usual sense. Once when organizations developed complex structures and management became an integral part of every business, theories about leadership emerged, and one of them is servant leadership.

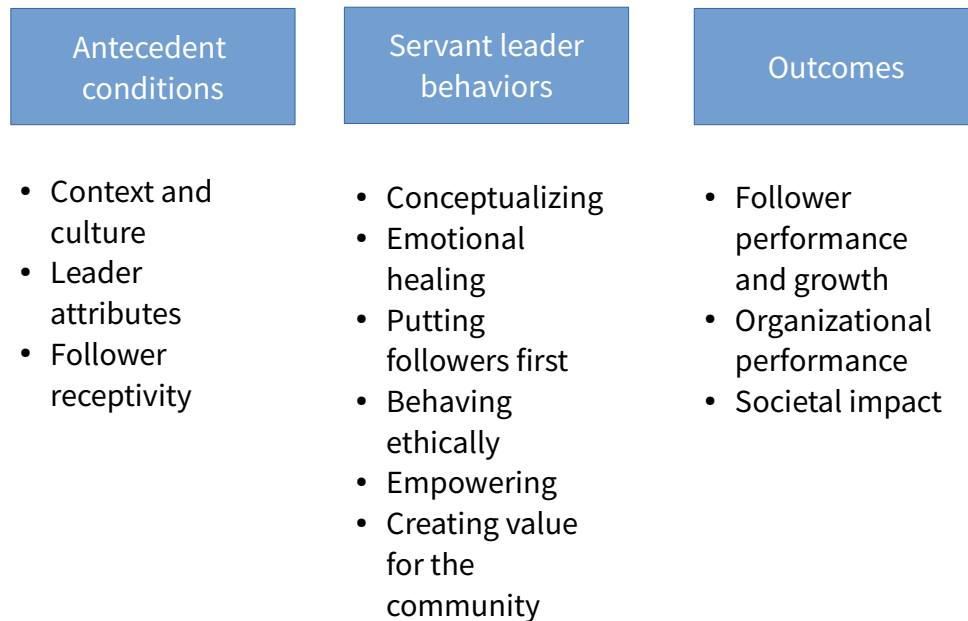
Servant leaders put followers first, empower them and help them develop their full personal capacities (Northouse, 2015). It is not about being served as a leader; it is about serving others. Many leaders could struggle with this element because they have already reached a certain level in their organization, so (s)he may feel that it is time for others to serve them. This is not a behavior of a servant leader. An individual with servant leadership would conduct the following behaviors (Northouse, 2015):

- Conceptualizing;
- Emotional healing;
- Putting followers first;
- Helping followers grow and succeed;
- Behaving ethically;
- Empowering, creating value for the community.

The strength of the servant leadership is connecting with team members. The key word is *connecting*. Usually, leaders communicate all the time but very few connect. If leaders connect with others at every level—one-on-one, in groups, and with an audience—their relationships are stronger, their sense of community improves, their ability to create team work increases, their influence increases, and their productivity skyrockets (Maxwell, 2010). Being able to connect gives the ability to identify and relate with people which increases one's ability to influence. Based on Northouse's research (Northouse, 2015), servant leadership is the only process that frames the model around the principle of caring for others.

Another strength of servant leadership is that it can be applied in various organizational contexts. While other leadership styles which are more rigid in nature can cause negative consequences especially in terms of relations between employees, servant leadership prevents the organization from this kind of trouble. If one has in mind that current business market is prone to fluctuations of any kind and that adaptability is one of the most valuable characteristics of any organization, this model's strength becomes even more important. According to some research, majority of the companies which

Figure 11.1: Process Map Which Depicts the Servant Leadership Model (Penn State, 2015)



were voted for the best place to work at apply this leadership model (Liden, Wayne, Zhao, and Henderson, 2008).

Finally, it should be stressed that servant leadership leads to more comfortable work climate which results in greater motivation and productivity of employees. The level of productivity has been chosen as one the parameters against which success of servant leadership can be compared. According to the researches which have been published during the recent years, organizational culture which is based on mutual trust and sense of freedom (which are outcomes of servant leadership) results in greater long-term productivity (Liden et al., 2008).

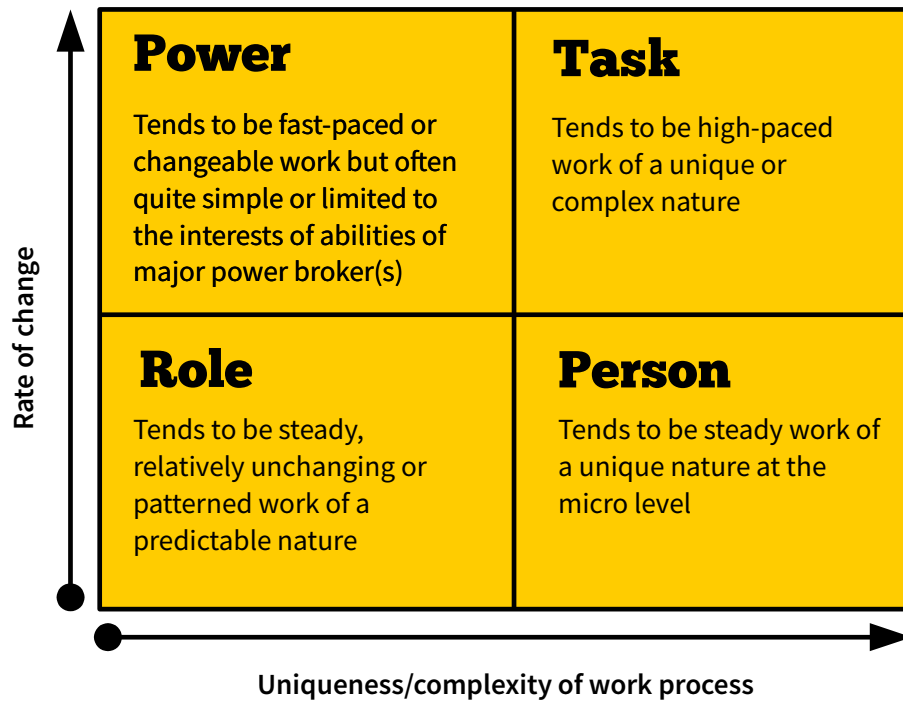
11.5 Organizational Culture

The model developed by Charles Hendy encompasses four different types of culture (managementstudyguide.com, 2015):

1. Power culture;

2. Task culture;
3. Person culture;
4. Role culture.

Figure 11.2: Hendy's Theory of Organizational Cultures (blog.readytomanage.com, 2015)



Power culture is present in those organizations where power is centralized. Centralized power means that only a few people in company hold the actual power. These organizations are characterized by a developed hierarchy.

When a **task culture** is dominant, organization is directed towards solving particular problems and in such organizations teams are formed according to the current needs. In these organizations, analytical thinking is valued.

Person culture is often connected with negative effects, as in such culture employees seek fulfillment of their needs, while they do not pay much attention to the needs of the organization. In most cases, this kind of culture leads to serious organizational problems.

In a **role culture**, there is a division of responsibility and different roles are assigned to different employees. The base for delegating roles is the expertise of an employee and his/her perception of their own capabilities.

When organizational culture is discussed, it is almost inevitable to mention the theory supported by numerous authors that national and organizational culture are tightly connected. For example, the authoritative society can have a large impact on how individuals set their own and expert objectives, perform errands and oversee assets to attain them (Lok and Crawford, 2004). Authoritative societies exert influence over the ways in which humans intentionally and subliminally think, settle on choices and shapes the way in which they see, feel and act (Lok and Crawford, 2004).

Some researchers (Kennedy, 1983; Waterman, 1982) almost three decades ago proposed that the authoritative society can apply extensive impact in organizational setting especially in fields of assignment execution and responsibility. Since people bring their individual qualities, disposition and convictions to the work environment, their levels of attachment to the organizational culture may vary (Lok and Crawford, 2004).

Qualities, state of mind and personal beliefs are reflected in diverse national societies. How individual qualities fit in with the current hierarchical society and the impact of national society on individual qualities could be a real contrast in the distinction in how firms in the East and West are overseen (Lok and Crawford, 2004). In diverse examination, it is recognized that there are critical contrasts in national society qualities between the Eastern and Western societies Chen, 2001; El-Kahal, 2001.

Chapter 12

Cloud Technology and Big Data as Sources of Competitive Advantage: Case Study

12.1 Information Technologies as a Source of Competitive Advantage

At the very beginning, IT was viewed as an important source of competitive advantage for companies. However, over the time it has proven that information technology is not an advantage by itself, especially because it does not take a lot of time to imitate it or implement the same system. Some believe that IT is no longer an advantage, but a simple necessity. Those who claim that IT is a necessity, also claim that *IT creates advantage by leveraging or exploiting preexisting, complementary human and business resources* (Powell and Dent-Micallef, 1997). The value of technology as we know it today was recognized during the last decade of the 20th century and there is a surprising number of articles from that period covering the role of technology in creating and sustaining competitive advantage.

Companies are vastly using IT as a source of competitive advantage, and Forbes published a list of 21 companies which are thought to be very successful in utilizing IT for this purpose. These companies are: Accenture, Amazon, Apple, Cleveland Clinic, General Electric, Goldman Sachs, Google, Hospital Corporation of America, IBM, Intermountain Healthcare, JP Morgan Chase,

Kaiser Permanente, Mayo Clinic, Microsoft, Nestle, Procter & Gamble, Progressive Insurance, Schlumberger, Target, Toyota, and Wells Fargo (Columbus, 2014). The most valued attributes of these companies are (Columbus, 2014):

1. Customer-driven IT;
2. Managing complex e-commerce systems and platforms;
3. Supporting multi-channel management;
4. Fast innovation.

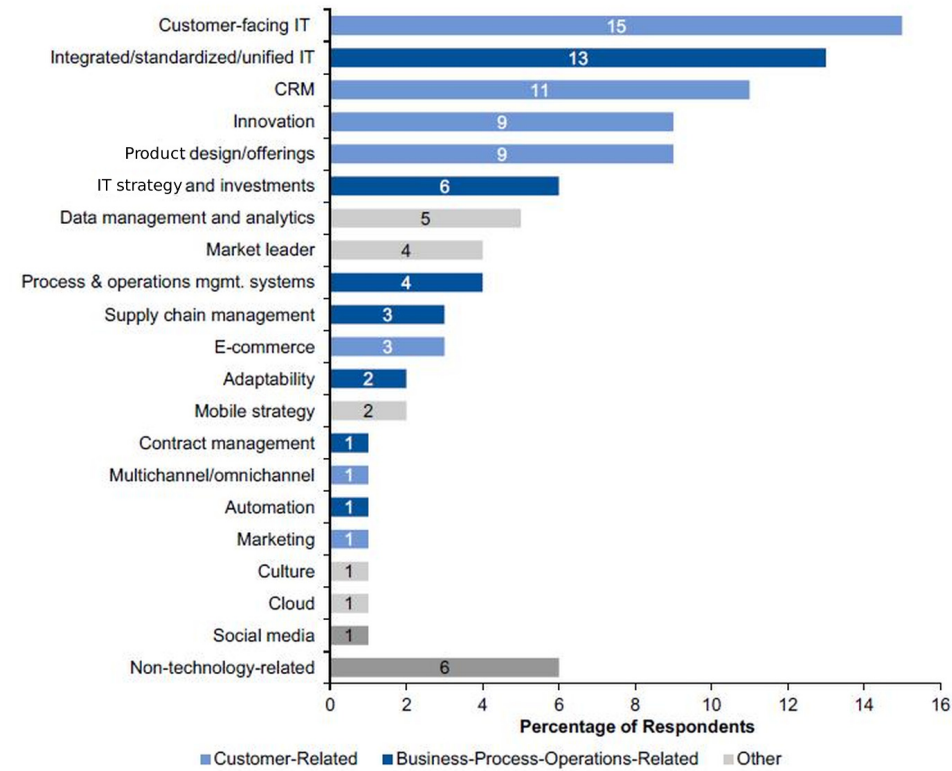
Highest executives who were included in the Forbes' survey also highlighted the following attributes of the previously mentioned 21 companies as the most impressive (Columbus, 2014):

1. Customer-facing IT (15%);
2. Integrated/standardized/unified IT organization and process framework (13%);
3. Exceptional use of CRM (11%);
4. Customer-centered innovation (9%);
5. Product design & offerings (9%).

There are some general pieces of advice for using IT as a source of competitive advantage (Ramey, 2012):

1. **The opinion of the CEO about IT utilization:** the CEO's vision can impact the way directors consider heaps of things inside of their organization, including IT. In the event that the CEO comprehends that IT can be a capable, aggressive weapon, a message is sent to the whole association that surfacing with imaginative IT thoughts that can prompt organization development and consumer loyalty is critical. Organization's authorities are essential in making the decision about IT as a source of competitive advantage.
2. **Using information technology to bridge the gap between business people and technical people:** in order to make use of IT and its perks, one must understand it. The best way to do that is to cooperate with the IT department and to integrate its members into the organization. This is important for another reason—the IT department cannot

Figure 12.1: What Impressed Business Leaders about the Admired Companies (Columbus, 2014)



provide the company with successful and useful solutions if they do not have the understanding of the business problem. It is also highly recommended that managers and business executives have a background in management information systems.

3. **Using information technology to view business problems from another perspective:** this essentially means that a business problem should be viewed from the customer perspective. IT systems have been used for some time to create superior customer experience. CRM (customer relations management) is one of the examples.
4. **Using information technology in creative design:** this means that a company should create systems which allow it solve problems in a different manner and not to repeat the same method over and over

again. Creating a system which is different from the ones competitors have is what creates competitive advantage.

12.2 Cloud Computing as a Source of Competitive Advantage

The IBM Center for Applied Insights together with Oxford Economics conducted a research in order to determine how companies use cloud technology as a source of competitive advantage. According to their data, currently 1 out of 5 companies recognizes cloud computing as a very powerful weapon for fighting for the position in the market (IBM, 2013). The sample in this research consisted of over 800 companies which employed the cloud. IBM created a following classification of these companies (IBM, 2013):

1. **Pacesetters** have deployed cloud on a broad scale and are gaining competitive advantage over their rivals through cloud;
2. **Challengers** are on par with Pacesetters in achieving greater efficiency through cloud, but still lag on differentiation and market responsiveness;
3. **Chasers** are more cautious about cloud. They are in early stages of adoption and are not yet using cloud to drive competitive advantage.

IBM found that the pacesetters were extremely more successful than the two other groups in the domain of market responsiveness. It has been uncovered that cloud technology provides these companies with a better insight into the market changes and that it also puts them in a position from which they can faster respond to the market demands (IBM, 2013). This group of companies which embraced cloud technology builds and maintains their competitive advantage through strategic reinvention, making better decisions, and deeper collaboration (IBM, 2013). Building a competitive advantage by using the cloud brings the following benefits:

- **Strategic reinvention:**
 - Reinvent customer relationships;
 - Innovate products/services rapidly;
 - Build new/improved business models.
- **Better decisions:**

- Use analytics extensively to derive insights from big data;
- Share data seamlessly across applications;
- Make data-driven, evidence-based decisions.

- **Deeper collaboration:**

- Make it easier to locate and leverage knowledge of experts anywhere in ecosystem;
- Improve integration between development and operations;
- Collaborate across organization and the ecosystem.

A group of companies labeled as pacesetters even identified the characteristics of cloud technology which would be of great value in the future. These characteristics are (IBM, 2013):

1. **Product/service building blocks:** easy-to-assemble industry or business service components they can use to construct new products or services;
2. **Even bigger big data:** Access to—and management of—vast data stores they can’t get to now (this was actually identified by other groups of companies as the most important);
3. **Industry-specific platforms:** Cloud platforms with applications and computing environments designed specifically for their industry.

A research undertaken by Harvard Business Review Analytic Services uncovered that 29% of companies have been using cloud computing for less than a year, 33% for one to two years, 20% for two to three years, 8% three to four years, 4% four to five years, while only 7% have been using it for more than 5 years (Harvard Business Review Analytics, 2014). The early adopters of cloud technology claim that it brought them greater competitive advantage and perks which have been already described (Harvard Business Review Analytics, 2014).

According to the sample, the most valued advantages of using cloud computing are (in order from the highest to the lowest ranked): increased business agility, flexible capacity, faster adoption of new technology, lower fixed costs, lower up-front costs to develop/deploy IT systems, and always on newest versions of software without IT updates (Harvard Business Review Analytics, 2014).

Figure 12.2: Current and Projected Use of Cloud Computing (Harvard Business Review Analytics, 2014)



Cloud technology provides companies with the flexibility needed in this modern business environment. They are in a position to be more responsive and even proactive. It also allows companies to test their ideas, to see how they work, and to either accept them or decline them without losing great amounts of money (Harvard Business Review Analytics, 2014).

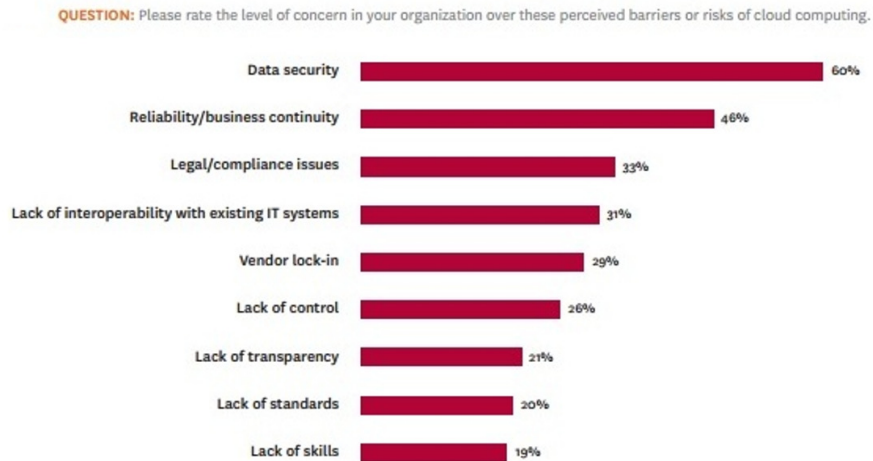
Figure 12.3: Advantage of the Cloud (Harvard Business Review Analytics, 2014)

Advantage of the Cloud	percentage agreeing
Lets us experiment more easily and at low cost	64%
Enables deeper collaboration with business partners	61%
Frees up IT resources to work on more strategic things	60%
Is a source of competitive advantage for early adopters	57%
Lowers the cost of doing business	55%
Lowers overall IT costs	55%

It was also investigated what type of cloud technology has been employed in companies which are using it and, currently, private cloud is the most popular (37%), followed by hybrid cloud (34%), while the smallest percentage of companies (29%) uses public cloud (Harvard Business Review Analytics, 2014).

It is also important to understand what is perceived as a disadvantage or problem with cloud computing in order to know what they see as potential threats to their competitive advantage generated by it (Harvard Business Review Analytics, 2014). Findings of the research are summarized in Figure 12.4.

Figure 12.4: Significant Concerns Associated with Cloud Computing (Harvard Business Review Analytics, 2014)



Finally, the competitive advantage generated by the cloud technology is still reserved for those companies which believe that benefits are greater than risks associated with it (Harvard Business Review Analytics, 2014). Some of the reasons why others are not using cloud computing are summarized in Figure 12.2.

12.3 Big Data and Competitive Advantage

Big data has already been accepted as one of the main sources of competitive advantage. In fact, it has been accepted by IT experts, while managers are still having problems with its acceptance. This is mostly due to their lack of knowledge about big data and the fear of large amounts of data and sophisticated analytics. However, one look at the potential advantages of big data leaves no doubt that it is a pool of opportunities for companies. Some of these advantages are (iveybusinessjournal.com, 2015):

1. Big data can unlock significant value by making information transparent;
2. As organizations create and store more transactional data in digital form, they can collect more accurate and detailed performance information on everything from product inventories to sick days and therefore expose variability and boost performance;
3. Big data allows ever-narrower segmentation of customers and therefore much more precisely tailored products or services;
4. Sophisticated analytics can substantially improve decision-making, minimize risks, and unearth valuable insights that would otherwise remain hidden;
5. Big data can be used to develop the next generation of products and services.

Of course, achieving competitive advantage through the use of big data is not an easy task. One of the reasons is the fact that many companies do not have their own resources to handle big data, and they outsource these activities to companies specialized in analytics (iveybusinessjournal.com, 2015). This creates more intense competition and it is harder to implement something new before everyone else and keep it from competitors (iveybusinessjournal.com, 2015). Still, as there are examples of companies that succeeded in this, it is obvious that it is not an unattainable goal.

Companies worldwide recognized the importance of big data in achieving competitive advantage and 87% believe that big data will have enormous influence on the market while 89% believe that companies which do not adopt big data will lose their market share (Columbus, 2014). Companies are already investing significant money in big data (around 20% of IT budget and majority of them believes that this percentage will rise in the future years) (Columbus, 2014).

Not only that big data is seen as a source of competitive advantage in the future, but it already is in following industries: aviation, wind and manufacturing industry (Columbus, 2014).

Companies also fear that others may recognize the value of big data before them and 74% claim that their competitors are already utilizing advantages of the big data in order to create competitive advantage; 93% of companies state that their competitors are using big data analytics as the main differentiation strategy (Columbus, 2014).

Figure 12.5: Investments in Big Data (Columbus, 2014)

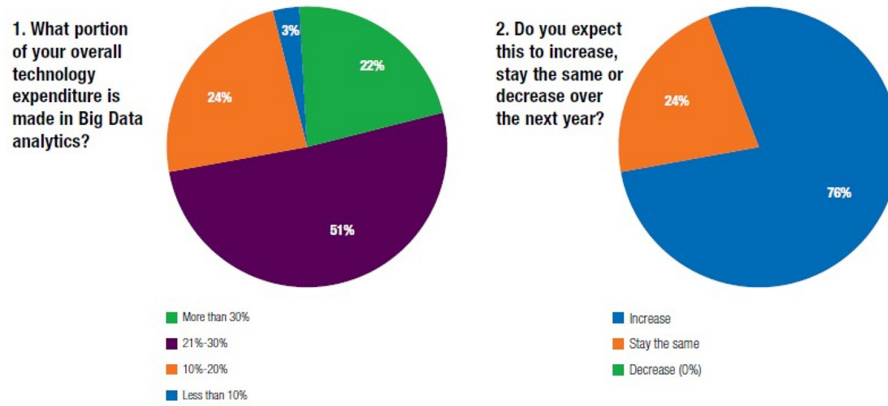
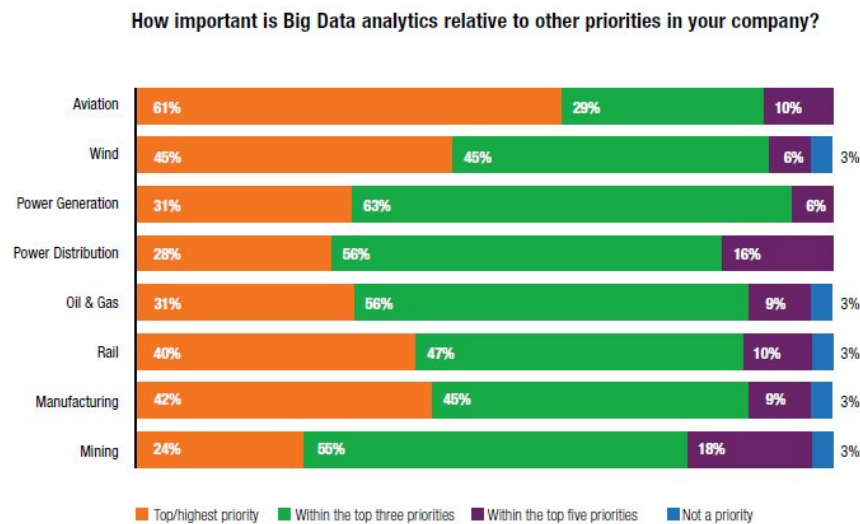


Figure 12.6: Big Data Analytics as Corporate Priority (Columbus, 2014)



Implementation of big data has its own drawbacks, and the main problems companies are facing are (Columbus, 2014):

1. System barriers between departments prevent collection and correlation of data for maximum impact (36%);
2. Security concerns are impacting enterprises' ability to implement a wide-

scale Big data initiative (35%);

3. Consolidation of disparate data and being able to use the resulting data store (29%).

Figure 12.7: Business Leaders' Fears of Not Implementing a Big Data Strategy

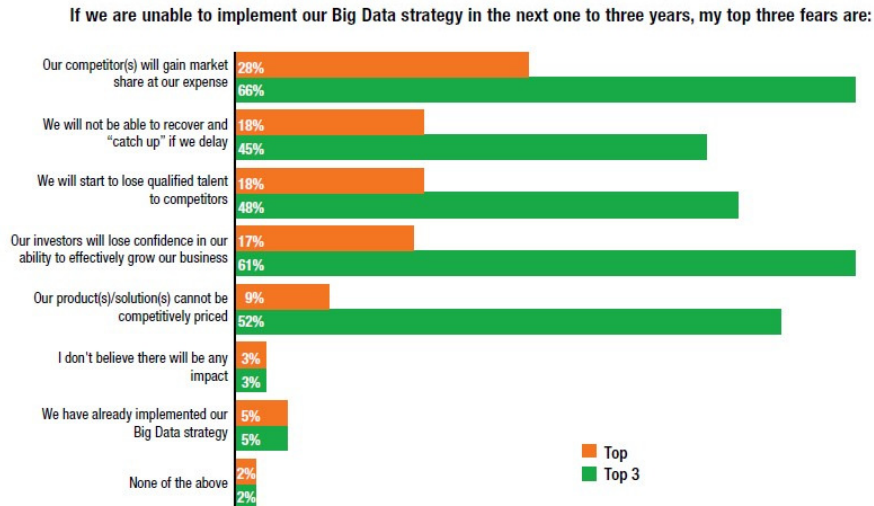
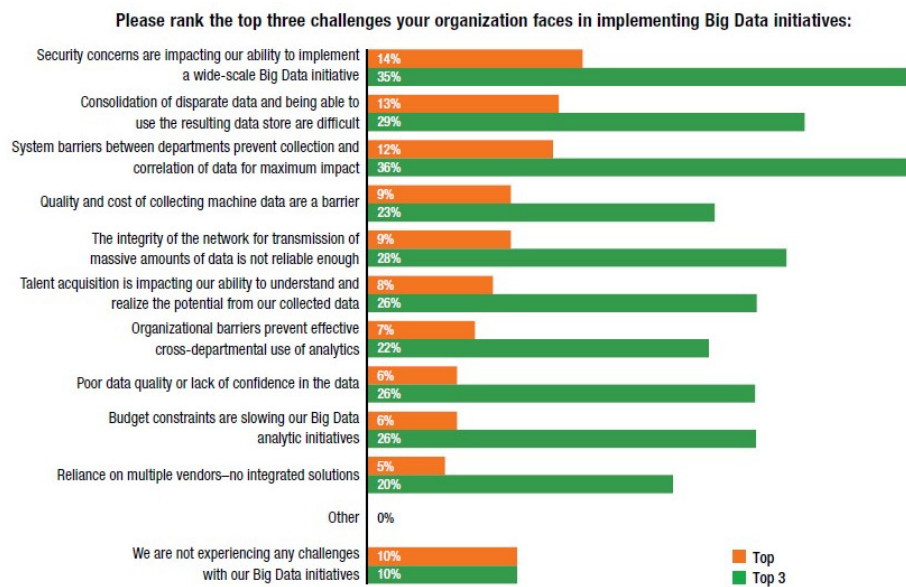


Figure 12.8: Top Challenges of Big Data as Ranked by Business Leaders (Columbus, 2014)



Chapter 13

Conclusion

Previous chapters of this thesis show that the debate about cloud computing and the big data as sources of competitive advantage is complex. There are many factors which influence a company's ability to embrace these new technologies. Analysis of the real-life examples showed that those companies which decided to accept and take advantage of these technologies mostly benefited from it, although a significant effort had to be invested.

A certain thing about cloud computing is that it transforms organizations into more compatible entities with the modern market. Changes that are constantly taking place call for more flexible organizations and flexibility which is exactly what cloud computing offers. However, this flexibility does not come with a simple implementation of cloud computing. In order to start the process of transformation, managers and executives need to assess a company's current position and future demand in order to choose the best solution. Cloud computing comes in different forms and with different specifications and no value can be created for the company if the chosen solution cannot be properly integrated. Cloud computing is not just a technical innovation, although there is no doubt that it exerts immense influence over the IT department of each company which uses it. It allows companies to take the best of their human resources, to manage it in a way which increases productivity, while the most comfortable environment is being created. Furthermore, cloud computing creates an opportunity for companies to adjust or change their core values and to put innovation and transformation in the focus. This kind of change has influence over the whole organization, from its lowest to its highest levels.

Big data also, apart from being a challenge, is a source of great potentials. It allows interested parties to have a more profound insight into the nature of events which are in focus. Big data is a step forward towards exploring things the way they are—complex and ever changing. It also provides us with a chance to gain a better understanding of many phenomena. Of course, all the progress cannot come without challenges. Big data is still a great challenge as we do not have the infrastructure which is appropriate for this volume and variety of data. There are technical problems such as lack of storage, complicated visualization, lack of more sophisticated analytical tools, etc. However, as it has been noted, these problems can be more easily solved than the one which is at the core of all others—understanding big data and figuring out what to do with it. This truly is the greatest challenge—once when the big data (especially unstructured) is properly understood, it will be way easier to develop tools for dealing with it.

Probably the best and most reliable confirmation of the statement that these technologies provide companies with a basis for competitive advantage is the fact that companies believe in that and see their competitors as greater threats once they employ cloud computing and big data. As it was pointed out several times, none of these two is a competitive advantage itself, but once they are implemented correctly, handled, used in the right manner, they provide companies with the opportunity to exploit external and internal resources and to turn the results of this process into competitive advantage.

Chapter 14

Biography



Miloš Jovanović at Harvard University, 2014

Born on August 23rd, 1991 in Sremska Mitrovica, Serbia.

Graduated in 2014 from Singidunum University, Faculty of Computer Science and Informatics, and holds an Honors Bachelor of Science degree in Informat-

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- ChinaX Series—Harvard University, 2015;
- Big Data and Social Physics—Massachusetts Institute of Technology (MIT), 2014;
- The Science of Happiness—University of California, Berkeley, 2014;
- Justice, Moral, and Political Philosophy—Harvard University, 2013.

Refined his leadership and creative economy skills in the United States, the United Kingdom, Switzerland, France, Germany, Belgium, the Netherlands...

Holder of the Karađorđević Royal Home accolade for outstanding success.

Fluently speaks English and is reasonably proficient in German and Russian.

Chapter 15

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