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# Using or Not Using Business Intelligence and Big Data for Strategic Management: An Empirical Study Based on Interviews with Executives in Various Sectors

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**Abstract**

Information Technology being an inevitable part of our lives changes the way of doing business every five or eight years. This known as technological cycle. The technology we use today becomes obsolete in several years' time and managers have to adapt themselves to new systems and new management styles. When big data is so big and important, its usage for business planning and decision making is getting more crucial as well. Business Intelligence tools or Executive Information Systems are improving their ability with the help of the Big Data available. Executives may use the merits of new systems when they make their decisions easily and more accurately as subordinates do when they use computers for daily business operations. Today's software systems can help the top management with making long term business decisions as much as they can with tactical and operational activities. However, it is difficult to say that those tools are being used by the top managements as they should be. Executives avoid using them for different purposes. They may not refuse them but might simply think it is not the right time to depend on such a system when they make business plans.

In this study ten interviews have been conducted with the top executives of the firms which are doing business in various sectors. The executives talked about how or how much they use Executive Information Systems when they make decisions. The findings of the study partly cover expectations or anticipations of the authors.


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*Keywords:* Executive Information Systems; Big Dat; Decision Making; Top Management; Business Intelligence.

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## 1. Introduction

Tools and concepts which are related to information systems (IS) have the utmost importance when it comes to making strategic plans and decisions in business life. Today, firms invest on data in order to extract valuable information and use it for operational, tactical and strategic purposes. In fact, with the increase of computer hardware technology, data stored on various sources and thanks to the new data analysis techniques, nowadays predictive and prescriptive analysis have become much more accurate than they were just a few years ago. The top managements of companies trust dash boards, charts, tables, numbers and statistics when they make their final decisions. All these values, simply speaking, come from information systems like Management Information Systems (MIS), Decision Support Systems (DSS) and Executive Information Systems (EIS). These systems process data to generate or extract information and finally present it to the top management in the form of tables, charts or dashboards. They serve at different levels of decision making. These levels are operational, tactical and strategical. Recent studies reveal that IS are used with Big Data for various purposes in different domains. These systems are either built as standalone programs or a part of bigger information systems. When they are built and used a part of a bigger system they are usually called as Business Intelligence (BI). In business they are used both for tactical and strategical plans and decision making processes.

When it comes to management, terms like Big Data, BI and Data Mining are quoted very often. It may be thought that EIS are regularly used by chief executive officers (CEO). As it is well known executives make decisions either based on concrete findings and numbers or they holistically make decisions trusting their experience, intuitions and perceptions. Both ways may have yielded successful stories in business life. Although, modern information systems are capable of supporting executives accurately and they are easy to access, it is difficult say that they are not used as they should be. Executives who are usually very busy with trivial things cannot spare time to use an EIS. They leave this job to their assistants and sometimes they even fail to pick necessary reports from them. Software firms do offer and sell BI and EIS modules to companies, yet those modules are not used by executives properly enough. Although programs are installed on their laptops or personal computers, executives do not use them and even do not remember that they have a BI tool to be used by themselves but not someone else in the company. Therefore, development of technology and these tools does not reflect on business life as it could be.

In this study an empirical analysis has been conducted to show how much BI systems are used by executives. A literature review is given related to BI, Big Data and their usages in different sectors for various purposes. In the second part of the article, data collection and empirical analysis are presented and then results have been discussed under light of the hypothesis or expectations that “BI tools are not used by executives appropriately”.

## 2. Literature Review

Any level of information systems i.e. MIS, DSS and EIS, embody the tools which provide managers with profound information that may be used for competitive advantage and/or for executive decision making (Yu, Chen, Klein, & Jiang, 2015). These systems are formed, designed and produced to satisfy the needs of executives and support them with strategic decision making procedures and activities. Information Systems process data to retrieve and extract information. These data usually come from sources like organizations’ transactional databases, ubiquitous financial information on line, analytical data publicly available, external news services, market trends and so on (Yu et al., 2015). Creating an overall system which includes the three levels of IS, has brought up a new definition to information systems domain: Business Intelligence.

Business Intelligence (BI) is all of the processes involved in extracting valuable information from large data sets and presenting it to the top management in order to assist them in planning and decision making (Turban, CAMERON FISHER, & ALTMAN, 1988). These processes are:

- Accessing necessary data.
- Integration of data.
- Data cleaning and preparation.
- Deciding on machine learning algorithms and techniques.

- Using online analytical processing (OLAP) and data mining tools.
- Generating descriptive and predictive reports.
- Performing prescriptive analyses.
- Presenting all the findings and results in a user friendly interface.

BI is used for various purposes by companies which operate in different sectors (Anandarajan, Anandarajan, & Srinivasan, 2012). Some of the usage purposes are as follows:

- Making strategic plans.
- Creating product variety and marketing.
- Determining current customer profile.
- Predicting future customer profile.
- Predicting customer tendency and loyalty.
- Establishing product / service pricing strategies.
- Getting suggestion to increase productivity and quality.
- Prescribing measures to avoid failures.
- Planning human capital.

It goes without saying that the information which will be extracted from a proper BI system is very valuable to the top management. That's why many firms invest on data and BI systems around the globe(Turban, Sharda, Aronson, & King, 2008).

A BI system should be constructed on a data set. The bigger and the cleaner the data set the more accurate information you will acquire. Therefore, a modern BI system is to be built on Big Data. On the other hand, BI does not only include *data* but also encompasses various hardware systems, algorithms, procedures and people. Data mining(Silahtaroğlu, 2013) is an inevitable part of BI. In order to achieve analyses done by machine learning algorithms a special workstation is needed. Today, by means of the developments in technology these hardware requirements and inevitabilities are getting cheaper and more accessible to even many small and medium size companies. Because the top managements understood the importance of Total Quality Management (TQM) a decade ago and applied quality measures and systems to their businesses, a great deal of firms have got standardized valid procedures and work flows ready to be used by BI systems. It is obvious that, contemporary managers are all computer literates and be able to use computer and software systems well. So, executive BI systems may be used with Big Data in today's business environment.

### *2.1. Big Data*

Big Data is a group of data gathered from different sources and in different formats such as text, image, voice or raster. These data may be collected from social media such as Facebook, Twitter Instagram, transactional databases of corporates, blogs on the Internet or videos and voice records. Although big data is thought to be huge in size like terabytes or petabytes, it is not the only feature of Big Data. Big data has got five well-known features. This is usually represented as 5 Vs of Big Data. As it is shown in Fig 1. these features are Variety, Velocity, Volume, Veracity and Value (Assunção, Calheiros, Bianchi, Netto, & Buyya, 2015; Vardarlier & Silahtaroglu, 2016).

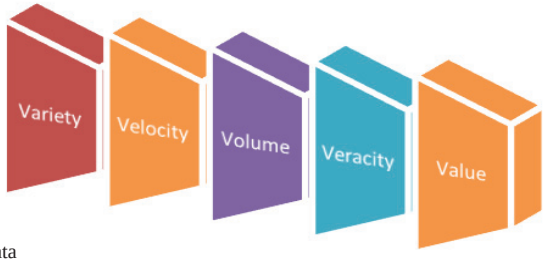


Fig. 1. Features of Big Data

The definition suggests Big Data is in various formats and should be gathered from various environments that is what the first feature **Variety** represents. Variety is expected to be high in Big Data(Assunção et al., 2015). The second V stands for **velocity** which means speed or rapidity and it indicates that Big Data is created or produced very fast and constantly. User Generated Data which resides on the Internet is a prominent part of Big Data. Everyday people create their own data in places like blogs, forums and video servers. Using e-commerce or e-government sites also contributes to user generated data (UGD) namely Big Data. This happens fast and endlessly. Volume which is best known about Big Data. Since we produce data constantly when we do business in digital environment, the size and dimensions of the data get bigger as well. This creates the **volume** characteristic of Big Data. However, Big Data should not be rubbish. It must be accurate and reliable besides being authentic. This brings the fourth feature of Big Data: **Veracity**. So, both collection and cleaning processes gain importance for building a Big Data Warehouse. Data sources should be well examined and audited by experts before trusting and using them. It requires a lot of effort and struggle to collect, clean and store. All these make Big Data costly; therefore, it has a high value. The fifth feature **Value** shows the importance, usefulness and cost of Big Data.

We may add a sixth V to the characteristics of Big Data: **Volatility**. In order to use the information in business life, we need more data apart from the one we have exploited for information extraction. So, similar data should flow through the same channels constantly.

### *2.2. Importance of Big Data and Related Researches*

Online user generated data has been used by researchers for different purposes. There are plenty of researches and success stories of using social media, user generated data in other words Big Data. A recent research shows that social media and its content may be used at time of a government crisis for communication. During the research 300 local government officials from municipalities across the United States have been examined and samples of the crisis like wildfires in California, the 2009 crash of U.S. Airways flight 1549, the 2010 Haiti earthquake, and Hurricane Sandy have been used, (Graham, Avery, & Park, 2015). In another study, researchers used data from Twitter and Facebook in order to analyse the role of user generated data (UGD) during the school crisis on September 30, 2014 during active shooter incidents in a high school, in the USA, (Mazer et al., 2015). The research focuses on rumours, misinformation, school message effects, thoughts and prayers. Analysis shed light how schools may manage social media during and after such crisis. Yates and Paquette took the Haitian Earthquake in 2010 so as to study how social media supports disaster and emergency response mechanisms from an organizational level, (Yates & Paquette, 2011).Besides crises, Big Data have been used for tobacco usage, (Link, Cawkwell, Shelley, & Sherman, 2015) and anti-smoking campaigns (Chung, 2015). In the related researches Facebook and YouTube data have been analysed. Both researches reveal that the effect of anti-smoking campaigns may be measured with UGD when it is combined with other databases and formed into Big Data. Nguyen et al., discussing the effect of social media on brand innovation, emphasises that customer needs are expressed in UGD and can be retrieved as information,(Nguyen, Yu, Melewar, & Chen, 2015). In the research it is also stressed that when social media content is converted into Big Data provides a set of rules for competition and may be used for strategic behaviour by business managements. Beyond brand innovation, another study was held to show positive and negative effects on the consumer-brand and consumer-other consumers' relationships, including community commitment and brand loyalty, (Luo, Zhang, & Liu, 2015). A similar research has also been conducted by Kim et al. to show the effects of UGD on firm value, (Kim, Koh, Cha, & Lee, 2015). The study discusses the role of restaurants' social media activity which is interactive with customers and its effect on the restaurants value. They have found that there is a considerable relation between two things. To quantify the popularity of urban restaurants, UGD at consumer review websites has been used by researchers, (Zhai et al., 2015). In this research Dianping.com was used for analysis. Although the research is about to show the relation between popularity of the restaurants and location, the research clearly shows that such an analysis is possible without physically visiting restaurants, instead we can learn facts just creating and using a Big Data platform enhanced with a special software system namely an Executive Information System. Using UGD and data mining techniques, the reasons which underlie the dissatisfaction of customers have also been revealed. The study has showed that a problem with the service or product may turn into satisfaction if the defect is corrected in a reasonable amount of time(Çınar &

Silahtaroğlu, 2012). Online Big Data has been analysed to learn if there is a relation between social media usage and academic performance of students. In 2014, two researches were held: One in Saudi Arabia, (Alwagait, Shahzad, & Alim, 2015)and the other was for the students in the US and Europe, (Ozer, Karpinski, & Kirschner, 2014). A more specific study has been performed by Zhang et al. They conducted a social media research with the help of CiteSpace II, they showed the evolution of social media study. They also discussed Collaborative Learning (CL) under the environment of social media (Zhang, Wang, de Pablos, Tang, & Yan, 2015). A BI tool has been produced in Romania, in order to be used by Romanian companies during an economic crisis. The software which serves as a DSS and EIS can be integrated with the enterprise resource planning software of the companies, (Edelhauser, Ionică, & Lupu Dima, 2010).

All these researches suggest that Big Data may be used for various business purposes including tactical and strategical ones. Nevertheless collecting and creating a Big Data Warehouse is one challenge and that is not enough. From the literature view, it is clearly seen that besides forming a BDW, the top management needs a special software, explicitly an Executive Information System augmented and enriched with proper machine learning and other artificial intelligence algorithms.

## 3. Analysis and Findings

### *3.1 Objective and Scope*

The objective of this study is to find out if the top managements or Chief Executives use modern BI tools and whether they benefit from Big Data concept when they make their strategic plans or decisions. In order to achieve this objective interviews have been held with the top executives of ten companies in various sectors. All of the companies operate in Turkey. Some of them do business in more than one sector so there are some overlapping sectors in the study. However, opinions of the executives have been taken for their general understanding of management.

The main hypothesis of the study is that top executives do not use modern BI tools and Big Data. Here is the formal declaration of *expectations* from the study:

1. Top managements do not use BI tools and Big Data for strategical purposes.
2. Top managements do not use BI tools and Big Data for tactical purposes.
3. Information Systems are used to generate standard, short term reports.

### *3.2 Data Collection*

A series of interviews have been conducted to collect data and information for the study. A semi structured interview technique has been used. All of the interviewees are either the chief executive officers (CEO) or the owners of the firms. At the beginning of the interview the interviewee has been given brief information about the current status of information systems, place of executive information systems in literature and related sector(s), big data and examples of business intelligence models. Depending on the computer literacy of the interviewee, the depth of the given information has varied during each conversation. However, it has been refrained from directing the interviewee or motivating him/her to use information systems in business or for strategic management. They have simply been informed about the current or possible usages of business intelligence tools with big data in sector. Table 1 shows the sectors and employee-wise size of the company.

After that, it is asked if they have an Executive Information System on their own computer that they use regularly to collect information and receive suggestions for various business plans. Interviewees has talked in a free format and been asked few questions during their talk. The questions directed to the interviewees are as follows:

- Do you have a BI or EIS on your own desktop PC or laptop?
- What kind of reports do you get from IS?
- Do you have any executive assistants who use BI tools or EIS?
- Do you have, discuss and update your strategic plans?
- How much do you depend on IS for your tactical decisions like…? (examples varies from one sector to another.)

*3.3 Findings*

As it is seen in Table 1 eight of the firms do not use or are not ready to use BI tools or big data for their business or strategic management. Executives accept that computer is an inevitable part of modern business and social life; it is not a luxury to use computers in business. All of the firms use IS for operational level. Office Automation Systems (OAS) and Knowledge Based Information Systems (KBS) are truly used by the firms. When they are asked if they ever use IS to make decisions or if they have a reporting system, they have given examples which indicate that they use MIS only. They have also mentioned that they can find data or information from chambers or governmental bodies. When they are given examples of usage of smart systems, big data and artificial intelligence, they have accepted that they may be used. Nevertheless, they responded that either it is not appropriate for their sector or their firm is not big enough to use such systems. All of them accept the importance of big data and computerized systems yet; they still use their experience, intuitions and perceptions when they make plans or decisions.

There are only two firms which use BI tools partially or indirectly. They have software tools like '*product data management*' which track the data of their machinery; however they do not have '*product lifecycle management software*' to support their systems. On the other hand they benefit from the merits of BI indirectly by purchasing information about the current status and the future of the sector. One firm works with research and consulting firms which provide reports generated using BI tools. The other firm which is a representative firm of an international automotive giant receives report from the headquarters. However, those reports do not cover everything the executives need in Turkey. The CEO of the company accepts that computer systems should be redesigned or new software installations are needed to build a BI system working on Big Data which is a must under today's market conditions.

Table 1. Sectors and sizes of firms

| Sector | Number of Employees | Annual Software Renewal Expenses | Approximate IT Expenses / Year | Use BI-tools or not |
|---|---|---|---|---|
| **Construction** | 1500 | $10.000 | $400.000 | No |
| **Tourism** | 500 | $8.000 | $100.000 | No |
| **Tourism** | 380 | $30.00 | $800.000 | No |
| **Logistic** | 350 | $15.000 | $100.000 | Partially |
| **Medicine** | 400 | $25.000 | $300.000 | No |
| **Textile** | 250 | $20.000 | $250.000 | No |
| **Automotive** | 600 | $100.000 | $1.100.000 | Partially |
| **Robotics** | 260 | $10.000 | $300.000 | No |
| **Restaurant** | 400 | $10.000 | $150.000 | No |
| **E-tailer** | 380 | $60.000 | $3.000.000 | No |

## 4. Conclusion and Discussion

The top managements of institutions and firms, no matter they are managing state institutes or private initiatives, hold several meetings in a month and perhaps in a single week. At least one of these meetings requires decision making to affect the institution's future and even the structure of the company. Also, it is obvious that every single day, a CEO has to make decisions about human capital, production, marketing, sales and payments. While some of these decisions are made by the help of experiences, perceptions or intuitions, some of them must be based on concrete realities, truths, numbers and examples. Right here, statistics, data mining, business intelligence and related software come forward. Managers are expected to use the modern computerized tools which are often labeled as Executive Information Systems (EIS) or Executive Decision Support Systems (EDSS). This is what is written in books and thought at schools.

In this study a series of interviews have been conducted with the executives of ten firms which operate in various sectors such as construction, tourism, textile, logistics, medicine, restaurant, robotic and e-tailing. The Interviewees

have been asked very few questions and motivated to talk about how much they benefit from information systems, business intelligence tools, big data, data mining and so on. They talked about how they make their strategical and tactical moves and if they use or to what extent they use anything like EDSS when they do planning. The findings of the study show that eight of the firms do not use any tools related to strategic management as it was anticipated before the study. Only two of the firms use such tools, nevertheless it may be categorized as *partially* usage of BI tools. These two firms receive reports about the sector from consulting firms or their upper body suppliers. The executives express their reasons for not trusting such tools are as follows:

1. There is always a risk in Turkey in their sector or market.
2. The relations and thing are so confusing that no algorithm or information system could sort it out.
3. When money plays, all theories collapse so a human brain is needed to adapt to the situation.
4. It is not possible to use these systems unless it is not supported by governments.
5. These systems do not apply to their sector.
6. Much bigger firms should use these systems
7. His / Her experience is well enough to handle strategical issues without using any software.

On the other hand, all of the executives without exception accept the merits and benefits of BI tools. Most of them expressed that the interview had inspired him / her to do new innovation in their information systems and those kind of talks should have been held more often with academia.

Scholars produce new theories and applications to be used in real life and under real market conditions. They are mostly well proved and useful studies. Executive Decision Support Systems, Business Intelligence tools or Big Data manipulation systems are some of them. They are truly useful instruments, nonetheless, as our study suggests, executives refrain from using them. Since they are the people who do business, take the risk and manage to survive in the market; should we accept that not benefitting from those technological instruments is the veracious and reliable approach or shall we go on with criticizing and condemning the sector for being away from academic innovations and technological solutions?

Finally, executives' approaches to Big Data and BI correspond to the expectations which are expressed before the study. It is obvious that market, economic conditions and other sectoral indications discourage them consulting those systems.

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