The Impact of the Digital Economy on Controlling

Csaba Ilyés
Budapest Metropolitan University, Budapest, Hungary
Bernadett Szekeres
Budapest Business School, Budapest, Hungary

Abstract

Due to the information technology revolution, the capacity of the IT data management has increased dramatically. Therefore, those companies which are unable to adopt the new opportunities, which can't integrate these data as the result of the digital economy, will be at a disadvantage in the long run. Integration of these databases into the operational or strategic planning allocates more information, since the company may get important information, which is sometimes absolutely critical for the company's survival.

Today, the big stores, the pharmaceutical firms and banks use such IT solutions whose costs cover a significant part of the sales and marketing budgets, and in addition to these solutions, tools did not even exist a few years ago. These drastic changes take effect on the activity and behaviour of the economy, so it affects the functionality of companies which was working for past centuries as well.

Based on the above mentioned, we can say that the company's controller and the controlling organization also must consider that in the future how to do, how to adapt the activities, processes within the company and outside the company, since a much larger amount of data is available, there is no difficulty to be able to get information to complete a task, solve a problem, but how they choose and filter data source, and then what conditions are used to limit the amount of available data.

The examples listed above reflect that an efficient use of digitized information nowadays is essential to make quick management decisions, it ensures a competitive advantage, and for this change the companies must change their traditional controlling activities.

If a company recognizes the inefficient practice of present reports, it raises the idea that it would be worthwhile to develop a new business intelligence tool. The goal is how to read the data in the future. It is important to know that before the implementation of the BI tool, what the practice of the organization is, what controlling activities are, how the relationship is between the decision-maker and the controller, how the controlling helps the business, how the controlling helps to set company's goals.

In the 21st century large companies want to keep the competitiveness and the implementation of BI applications is very important for it. The advantage of BI implementation is that the new system uses pre-defined templates to be able to get information for an entire business, to get complete analysis on time, on product or company level very fast. Thus, it follows that the applied BI can help employees and managers using the basic functions can get the information of a client, markets very easily in just a few seconds.

First and last we can say that the use of the digital economy the businesses become more productive and efficient, and they could enter into the digital market of the world economy, so their business could operate more effectively.

Keywords
Controlling, digital economy, business intelligence.

Introduction

At present, due to the information technology revolution, the volume of data which are processed and the capacity of the computing systems has increased dramatically. Under the present circumstances, those companies that are unable to live in the new facilities and do not integrate the data as a huge information base of digital economy, may be at a serious competitive disadvantage in the long run. The integration of these data-

bases brings additional information for the company in both operational and both strategic planning sides, because it is clear that this information brings important information, which sometimes is essential.

This study aims to verify that the fast and effective decision-making executive business intelligence solutions are not only a competitive advantage, but also providing up to date information is considered a basic requirement for all users. Research questions are in relation to the objective of controlling activities related to the future: we are looking for an answer to the questions how the digital economy changes the controller activity, and whether modifying the decision supports the functions of controlling.

In our analysis, we describe the practical implementation of digital technology through many sectors and after that we interpret relevant determination connected with our research based on domestic and international literature, concerned with both business intelligence and controlling the activities. Due to the nature of theme works, based on online resources we show the usage of domestic business intelligence and we examine the controlling functions' - planning, monitoring, information supply and reporting – changes that affect the everyday work of the controllers as well using case studies. We finish our study presenting the benefits and difficulties, expectations and experiences from the application of business intelligence solutions and the results of the tests obtained by summing, statements based on practical applications.

1. Digital technology nowadays, business intelligence systems

Businesses should use innovative solutions, since it will be able to fully exploit the potential of digital technology benefits and opportunities on the one hand in order to improve efficiency and productivity, and on the other hand, in order to reach your customers and operate your business to ensure higher profits.

Digital economy

The importance of e-commerce eloquently demonstrates their research results, according to which an average of 21 or even 33 per cent of developed countries' GDP growth can be traced back to the Internet. For example, at the 2015 Hanover technology fair, CeBIT had digital economy as the central theme. The traditional German agricultural

companies can digitize their activities. The Claas "clever tractor" recognizes obstacles on its way and makes the work more efficient by using intelligent navigation. It creates a production (output) map on which the farmer knows exactly how much they can harvest in any cornfield.

What opportunities can the rapid expansion of digital economy offer the players of the national economy, and how can e.g. internet help market-making activities and market operators whether in small and medium sized companies or large companies?

Today, the supermarket chains, pharmaceutical companies and banks use such IT solutions, which accounts are a significant part of the sales and marketing budgets, and in addition to these solutions, tools did not even exist a few years ago. This operation can change drastically the performers of economy and it has an impact on the operation of companies in the centuries-old heritage. The economic environment is going through a change never encountered before, which requires performers to update their knowledge and ability of continuous learning and adaptation to new challenges.

Business intelligence

The first definitions related to business intelligence systems come from Luhn, who in 1958 dreamed of a future in which using the complex, intelligent systems the information can automatically be obtained among the accumulating data, and therefore storing the information and the distribution of it to the right people becomes much more efficient (Luhn, 1958). The term itself was introduced into the professional vocabulary towards the end of the nineties, before a decision support system (DSS), management information system (MIS), or executive information system (EIS) definitions are used (Sidló, 2004).

The second definition is came in 1989 from Howard Dresner (Dresner, 1989), which is considered most generally more accepted in the literature definition: "The business intelligence is all of such methods, concepts which improve the decision-making process using the so-called evidence-based Systems (MIS, DSS OLAP, DM, ...) help."(Cser, Fajszi, & Fehér, 2010, p. 39)

In the nineties, new trends emerged and the need arose for online analytics, customizable plan-fact analysis and forecasts. Such technologies, applications, which elements of the scope of business intelligence, have the main aim to ensure proper storage of data, real-time access to corpo-

rate decision-making and support a variety of analysis, forecasting and data mining capabilities. Due to Howard Dresner's definition it can be stated that BI is not software, which is available after installation, nor a classic enterprise resource planning (ERP) system that operates after setting the parameters, but something much more complex: multiple software coordinated operation, data warehouse of technologies. Thanks to incredible technological development in the 21st century in the same technology functional areas, which exist in the EIS, DSS and MIS applications based on the repository house. The business intelligence systems are the combined and improved technology of them. (Kővári, 2007)

Eckerson projected in the future the following changes in advance in respect of the business intelligence (Eckerson, 2016):

- *BI tools move away from the use of desktop machines;*
- *The cloud technology is reaching a turning point;*
- *Application extensions of BI becomes standardized;*
- *The management of the data "sea" gets management tools;*
- *Data Analysers discover Data Catalogues;*
- *BI managers' influence increases in the world.*

In summary, we regard business intelligence as a collective term that includes all system architectures, tools, databases, applications and methodologies, with the aim of data analysis being a decision support tool for corporate management.

It is important that we look at the world's business intelligence systems, as in the 21st century, for a large company wishing to preserve the competitiveness it is very important to introduce the BI application. We need to consider what the term itself is that is used, what we can see in terms of its importance, usefulness, and what a plus for users, which greatly facilitates their weekdays. The new system has the advantage of using the predefined templates, thus the enterprises are able instantly to perform a complete analysis of geographical, time, or product level, and the matrix for an entire business. It reveals that with the help of BI the working staff and managers using the basic functions they can get the information of a client, and market it very easily in just a few seconds.

2. Changes in controlling activities

Today for most large companies the most challenging is to fight preserving competitiveness. Everyone strives to achieve the highest possible results with the least effort, so that standards are raised, growing higher and higher. We can detected in the previous examples that in a company the controller, i.e. the controlling department must also consider the future activities and processes and they have to overview how to perform these, how to adapt to all within the company and the company's micro and macro environment with much higher amount of data available. The difficulty is not to be able to obtain information to complete a task, solve a problem, but how, by what means, select the data source, and narrow down the amount of data available based on what conditions exist inside it.

We can conclude that all aspects of online commerce have several options in the future. This has a great importance from the controlling point of view, because one must consider the preferences of customers, their payment habits, resulting in almost immediate access to information on the sales revenue, margin analysis. Exploring the causes of planned and actual differences and preparation of decision-support materials are performed much more effectively and faster.

As one way to reduce public spending we offer online modern, efficient tools for public services. The efficiency gains are achieved so that businesses, people and workers in public institutions alike see their lead. In addition – just like online commerce – the additional information stored this way is used for analysing the operation.

The degree of efficiency through digitization services offered in the health system can be greatly improved. The controlling analyses of digitized information and setting future goals become more established by the use of such information.

The controller - we can see at least three levels as IT end user - such as Individual level where the worker himself appears, he or she looks for and uses technology required for the work. The second level is the level of functional units of the company. At this level, the department's needs, searching, selecting and applying appropriate functioning of key applications. The third level is the level of the enterprise, which covers all areas of the company, from sales to production (service office). At this level is also emphasized the exploration of future needs, the release of the IT strategy. The controller makes plans, makes decisions,

writes reports, communicates with colleagues, managers, collects, organises, and stores information necessary for their work. These functions are consolidated together in the following figure, which divides the tasks into four areas.
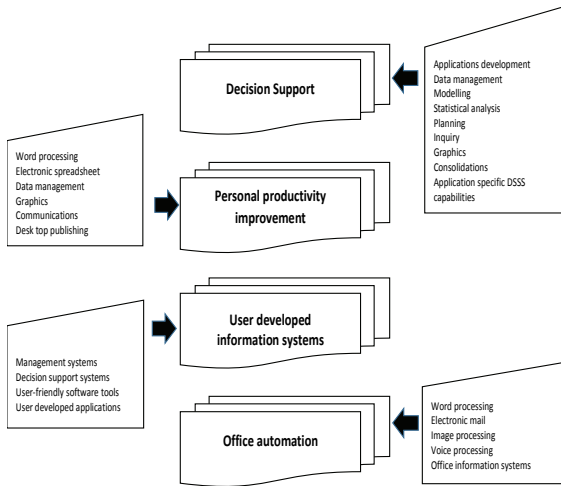
Picture 1   The informatics end user categories of a controller
Source: Long, 1989

The examples listed demonstrate that effective use of digitized information is indispensable today to make quick management decisions so as to ensure a competitive advantage and is necessary to change the traditional controlling activities.

Changes of controlling activities in practice

What trends can influence digitized society and how do they influence the controllers' work? On closer examination of the issue, two major strands emerge. On the one hand, in business, and on the other, changes occurring in technology. To do this, we can set out the work of Steven Alter wrote in 1992 (Alter, 1992), which has preserved its actuality today.

Trends in business

- *Widespread application of using computers;*
- *Ongoing convergence of computing and communications;*
- *Increasingly automated workflows;*
- *Information brings more and more value;*
- *New forms in organizations and management;*
- *Increasing dynamics in business;*
- *Accelerating global competition;*
- *Gradual acceptance of global standards.*

Trends in technology in terms of information systems

- *Increasing capacity and speed of electronic tools;*
- *Digitized information growing number availability;*
- *Easier portability of electronic devices;*
- *Expanding connection, connectivity possibilities;*
- *Expansion of application opportunities;*
- *Automation of human thinking will eventually happen.*

These trends almost all make an impact on the controllers' work, due to the fact that digital economy has changed the controllers' work, because before it the controllers analyse the business and compare plan-actual data based on weekly, monthly closing data performed. They are able to give recommendations for decision makers after the results reveal the reasons for the differences. It requires relatively long times, often only provided an opportunity for "fire-fighting". However, mitigated by the effects of a long series of coincidences, in individual cases, it was not necessary to use techniques that treat these outliers. This "extended" period – up to an annual series – gives a very well founded analysis for the work efficiency and productivity, and consequently, revenue improvement.

Today, however, we have such very detailed data, which can be available by job groups, by technology of production or per shift. This means a huge amount of material, for which the need to use statistical methods becomes much more important. Let us consider the fact, that even after data shift, analytics are to be implemented. We can give the managers a short time in which they can intervene in the company's processes more quickly and effectively, thus meeting the corporate objectives would take more.

Analysing data in such shorter periods, however, may have more uncertainty. In case of a shift in the role of coincidence is present to a greater extent, longer data series smooth out these fluctuations by chance that the results of the analysis of the data sets more useful. Several methods can help in the treatment of this problem, for example, application of the Six Sigma method.

We should not forget that today controllers must use IT tools, manage the growing data needs increasing IT knowledge. When performing each task, especially in areas where a large amount of data is available before or perform the work them-

selves or together, they must answer with their IT colleagues the following questions due to Alter:

- *What data and information will be required?*
- *Where and how will the data be collected?*
- *How will the tests' results, analyses be transmitted?*
- *Where will the results and the data themselves be stored?*
- *What applications will be used for the treatment of the data, and how will these applications be linked with existing systems in a unified enterprise information system's structure?*

Most of these are of technical nature, but it is also important for the controller issues. They essentially determine the success of future activities, which may directly or indirectly, influence the effective and successful operation of the company.

Another important change of the controlling work was the 2008 crisis, which influenced the extent and depth in almost every industry and company. What challenges did the controlling encounter in connection with the crisis?

The controller must support for a variety of businesses, management institutions to provide the necessary information for their work to executives working at different hierarchical levels. This information, of course, should be improved taking into account the business around customer business environment, managerial and executive level is needed. If there are changes, the controller's job is to convert the information to new demands. The crisis has seriously affected most sectors, almost every organization and therefore the individual activities of daily drivers as well. This means that they needed to develop a new approach to controlling tasks.

Of course, the three key pillars of controlling activity have not changed; only the main points, the reporting system has changed. Tirnitz (2010a; 2010b) have shown based on an empirically survey that a significant number of companies use about 2-22 days, (the mean value of ten days) to prepare standard monthly reports. Such companies, which are strongly affected by the crisis, however, have typically faster and completed monthly report within 10 days. In connection with the weekly reports are increasing expectations that after a week closing Friday the controller has to compile the weekly data on Monday morning. Also, based on empirical data it stated that the

aforementioned shorter turnaround compiling reports of the companies have not been used for more workforce. Reducing the time usually means a more efficient use of IT support. Among the larger companies using management information systems and where the impact of crisis was significantly detailed, they needed less time to prepare their reports than those who had less of the crisis was felt. The managers of company have become critical quickly and very succinctly, but can receive in a transparent way the information necessary for their work. The research also showed that the size and content of reports has been reduced. The crisis has significantly reduced the number of companies, which used 30 more pages monthly reports, while such companies, which compiled more 100 pages of reports with some exceptions, have disappeared. The average size of reports decreased from 15 to 12 pages. This is a serious challenge for a controller as a huge quantity of data provided by the digital economy will be compiled into a tighter but useful managerial report.

The tasks of controlling depend on the size of a company, organizational complexity, and business circles. The larger, more powerful company has more difficult controlling tasks. In a highly dynamic economic environment where the competition is extremely strong, controlling is running as a separate organizational unit. If an enterprise recognizes ineffectiveness report practice, it raises the idea that it would be worthwhile to develop a new business intelligence tool. The purpose of the change is how the available data can be read "differently".
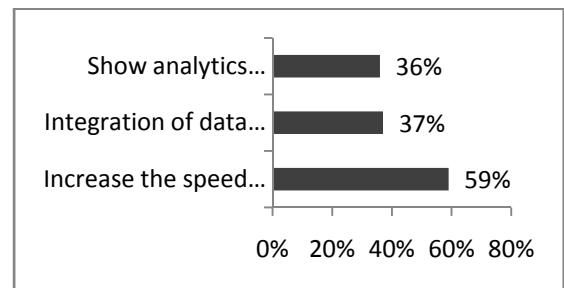
Picture 2   The three most frequent reasons of business intelligence implementation based on the surveyed SMEs
Source: Kővári, 2007

In our analysis we came to the conclusion that the first important step is to understand what practices a company follows before implementing the BI tool, how is working the budgeting and control activity of controlling, and how the decision eventually influences on the way it helped the com-

pany to achieve its objectives. The factors and reasons that have led to the change in the existing methodology should be explored after that. In addition beside the strengths and weaknesses of a new system introduced one ongoing goal is the maintenance and further development of the implemented system, because if not fully exploited, for example there are extra data that does not contain even more, and it would be important to make our systems available to others. During the practical analysis, we examined the two companies about the effect of the digital economy on the traditional controlling activities.

3. Case studies

Case study 1

The first company provides telecom and IT services. Its traditional market is means of telecommunications, but a rearrangement of the scope of activity can be observed. In addition, beside the previously less pronounced IT services where we can experience significant expansion, the company recorded a significant reduction in case of telecommunications revenues. As long as in the case of telecommunications services the customers use standardized services, while IT activities reflect a unique nature of project-based tasks. The environmental challenges put pressure on company leaders to develop more quickly and adapt to changes in organization. One of the pillars of the development of the internal information system is a better use of available data. During the analysis, we examined how the controlling functions can be improved using advanced digital data processing and, despite the fierce market competition, how to be able to increase sales revenues by an advanced decision support system that will be implemented, because this new system could form the basis for effective management.

The company's leaders realized that the dynamic growth of data volumes needed to be processed, which complicated the traditional spreadsheet management systems and made them difficult to solve. In addition, there was an increasing need to compare planned and actual data, flexible and user-friendly reports for executives. All these lead to development for the company's managers. The next step was the formulation of demands on the new system. The basic objective was to support the planning and preparation of the report controlling functions, and intuitive management using advanced analytical tools and flexibility in the data structure is incurred by the staff. The in-

troduced new tool of company is a single and unique database, which in fact organized and plan data stored in applications multidimensional cubes; and a key user interface for managing applications and cubes, and finally, key and end-user interface to query the data, so overall was introduced in the enterprise performance management and business intelligence application.

The business intelligence tool for company stores data in eleven dimensions, the fact regular data are stored by ten minutes, the loading process automatically updates the database, but the data load starts manually, if it is necessary. These activities are carried out by object groups, and plan-fact analysis is made in the different structures. The original goal was to improve the analysing and controlling reporting features, to enhance the end-user ad hoc query and fast possibility of access options to the data-item, self-report preparation, and easy to maintain reporting structure has solved.

We can state based on experience after the introduction of the new tool:

- support for controlling activity is corresponding with expectations,
- the flexibility of the multidimensional data cube makes the system suitable to meet the new needs that arise,
- easy to use, easy to learn to use,
- they are not fully exploited the possibilities offered by the system.

Case study 2

The second company is a financial institution where the controlling operates as a separate division, has a wide range activity and it has a diversified relationship with the other business units of the institution. The units of the financial system are increasing burden in recent times, which significantly affects their operations. Financial institutions studied have a significant position in each business line, and that they want to keep the long-term reason of the preparation for extraordinary events, often-changing environmental influences and the constant, stable, even resulting in increased operation, especially paying great attention to the development of the controlling activities. The management's objective is to maximize the efficiency of the internal processes of the opportunities, to find such tools, methods, which are the most able to support decision-making. In addition, the financial institution operates as a subsidiary of a foreign parent company in a country, so

every year strategy, future plans are greatly influenced by expectations that the parent company imposes on them.

In case of a financial institution the basic problem was that typically, the received report could serve the needs of the central data warehouse and retrieve the data; however, a special program was needed, which was not appropriate skills across all disciplines. Thus extracting the information required a lot of time. The experts were not able to make good use of, or because of inappropriate management practices in the tables drawn data, or because the accumulated data was not read out, for a given month information so that they could not observe the trends. The financial institution required to move constantly, comparable monthly executive reports in time and space, which could not be met from the available options. Thus, the demand is a faster, easier, more meaningful data available access in the data warehouse, which meets the individual needs. It has become necessary to create complex data generated not only themselves but also elemental depth should be examined down to the transaction level. Against this background, the new demand was born to build a new business intelligence system.

The implementation of the new system took place with the involvement of external experts, as an outsider firm can assess the strengths and weaknesses much more realistic, they can see the operating habits for optimal in notices of risk threats. So actually, a system has been developed which fully meets the expectations of leaders.

The BI platform system was set up displaying the usual spreadsheet. The new system does not use a separate program, but known and used software has been built into the relationship between the systems. The BI uses tables and lists not prepared in advance, but through direct contact with extracting data from the data warehouse. Thus, within a few seconds at any time it is made using a huge amount of data corresponding detection, reporting, and illustrative diagrams. The principal dimensions, by which the actual data can be grouped and analysed are in the hierarchical relationship, which means that there have been pre-subordination, hierarchical relationships between elements of the given hierarchy mapped in the system. With the dimension segment can collate the data and indicators are among the factors about pre-defined for different segments, according to which they would like to calculate the actual data.

The advantage of the new system is that the data significantly improved the purity of data, sharing more accurately trackable customer movements. The actual and planned results allocation among the different business units is fairer and more realistic. Because of these conditions, it is possible to analyse the past, to develop action plans, so that the main purpose of the system i.e. decision support is fulfilled. The key of the system is the possibility of movement in time and space at the same time when a leader or staff member wants to see the results or the performance of the portfolio in the given business unit. The answer to that demand is quickly recovered from the system. The disadvantage of the system is that currently they record in separate systems the administration of the new customer relationships and the negotiations of the acquisitions. The future goal is for most of the information to be in one place. This information has to be collected and has to be readily available to everyone within one system. At present, the system contains only profit and stock information, but many other systems are still related to customers or products data. The main objective in the future is that the most of the data will be available from the BI system, so it gives a complete, dynamic data management across all possible data.

Conclusions

Nowadays, due to changes in environmental, business and technological conditions, it is no longer sufficient to use conventional approaches of controlling. According to the new challenges, controlling activities can vary, but the task, i.e. providing information for decision-makers, remains. The companies' managers want to get information faster, highly aggregated, more or less graphically, which are prepared by the controllers based on the digitized economy. Thus, their activity influences the business and results of the company. One special area of change in controlling activities is using business intelligence (BI) tools. Our research and analysis revealed that using digitized economy, businesses improve a level of efficiency and productivity, whereby they could put their feet in the digital world economic market, and their business could operate more effectively. The future-oriented thinking is the essential condition for more successful improvement and competitiveness. SM

References

Alter, S. (1992). *Information Systems: A Management Perspective.* Boston: Addison-Wesley Publishing Company.

Cser, L., Fajszi, B., & Fehér, T. (2010). *Üzleti haszon az adatok mélyén. Az adatbányászat mindennapjai.* Budapest: Alinea.

Dresner, H. (1989). *Howard Dresner predicts the future of business intelligence.* Retrieved January 10, 2017 from Business Analytics/Business Intelligence information, news and tips - SearchBusinessAnalytics: http://searchbusinessanalytics.techtarget.com/podcast/Howard-Dresner-predicts-the-future-of-business-intelligence

Eckerson, W. (2016). *Business Intelligence in 2016: What to Expect.* Retrieved January 12, 2017 from https://www.linkedin.com/pulse/business-intelligence-2016-what-expect-wayne-eckerson?forceNoSplash=true

Kővári, A. (2007). *Üzleti intelligencia.* Retrieved January 12, 2017 from Adattárház és üzleti intelligencia - Biprojekt.hu: http://www.biprojekt.hu/Uzleti-intelligencia-Business-Intelligence-BI.htm

Long, L. (1989). *Management Information Systems.* New Jersey: Prentice Hall.

Luhn, H. P. (1958). A business intelligence system. *IBM Journal of Research and Development , 2* (4), 314-319.

Sidló, C. (2004). *Összefoglaló az adattárházak témaköréről.* Retrieved January 10, 2017 from Csaba Sidló ELTE: http://scs.web.elte.hu/Work/DW/adattarhazak.htm

Tirnitz, T. (2010). Néhány gondolat a válságról a controller szemszögéből. *A controller , 2*, 1-5.

Tirnitz, T. (2010). Néhány gondolat a válságról a controller szemszögéből. *A controller , 4*, 3-7.

✉ **Correspondence**

Csaba Ilyés

Budapest Metropolitan University
Nagy Lajos király útja 1-9, 1148, Budapest, Hungary

E-mail: Ilyes.Csaba@uni-bge.hu