

BUSINESS INTELLIGENCE ADOPTION IN LARGE ROMANIAN COMPANIES

Case studies

Keywords

Business Intelligence
Economic competitiveness
Decisional process
Absorptive capacity

JEL Classification

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Abstract

The economic conditions and market competition create pressures on companies to adopt new technologies that can provide more efficient information and can support decision-making better.

The purpose of the research is to investigate the decision support information systems in order to apprise and enhance the capacity of the entities to apply the new knowledge that BI produces for organizational success and competitiveness.

The importance of the conducted research consists in identifying solutions to improve reporting and stimulate the entities to start using business intelligence (BI) technologies, which facilitate obtaining new information, in order to ensure flexibility, resilience and provide answers to questions that go beyond what the pre-defined reports can do to support decision-making.

The estimated result is a technical and operational overview of the large companies in Romania, drawing future directions for an improved competitive behaviour and strategic awareness, and identifying the significant factors for optimizing the decision-making process.

Introduction

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The importance of the conducted research consists in identifying solutions to improve reporting and stimulate the entities to start using data mining technologies, which facilitate obtaining new information, in order to ensure flexibility, resilience and provide answers to questions that require very specific analysis that goes beyond what pre-defined reports can offer to support decision-making.

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Literature review

All enterprises, regardless of the services or products they provide, are really information businesses. The accuracy, speed and precision of IT systems makes the difference between winning or losing customers, keeping supply chains profitable, and transforming new concepts into revenue-producing products and services. The world's best-run services businesses have customer-driven IT as a core component internally (Columbus, 2013). Thus, partially, competitive advantage can be attained through adopting new, complex IT applications.

Gartner warns IT departments to not become complacent over time, as the IT revolution is continuous. It is vital for CIOs to cease focusing on control and keep challenging their organizations to explore new developments, seeking out how they can be used to strengthen business strategies that can help growth and competitiveness (Columbus, 2013).

According to Pierce et al. (2006) knowledge is more than information, and this stems from the statement that knowledge is rather a process than a product. The knowledge process occurs when an individual mentally synthesizes together a mixture of inputs: information experiences, beliefs, relationships, and techniques to determine the meaning of a specific situation and how to handle it (Melkas, Uotila, & Kallio, 2010).

Mainly in times of competitive pressure, organizations are forced to open their innovation process and use external knowledge sources to

increase their innovative potential. A key factor to enhancing the organization's ability to benefit from externally acquired knowledge and achieve a competitive advantage is its absorptive capacity (Cohen and Levinthal, 1990 apud Duchek, 2013).

Zahra & George (2002) identified four dimensions of absorptive capacity: acquisition, assimilation, transformation and exploitation and defined the concept by distinguishing between potential (acquisition and assimilation of knowledge) and achieved (transformation and exploitation) absorptive capacity (Noblet, Simon and Parent, 2011). Zahra and George (2002) have redefined absorptive capacity as "...a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability". The authors state that "...firms can acquire and assimilate knowledge but might not have the capability to transform and exploit the knowledge for profit generation" (Duchek, 2013).

Although highly important, the ability to recognize the value of new knowledge is not sufficient to enhance a company's innovative potential (Duchek apud Pennings and Harianto, 1992). Cohen and Levinthal (1990) stressed that firms must also develop organizational capabilities for integration and utilization of the newly acquired knowledge (Duchek, 2013).

It is assumed to be a set of organizational capabilities by which firms acquire, assimilate, transform, and exploit outside knowledge to produce a dynamic capability (Duchek apud Zahra and George, 2002) that is directed toward facilitating organizational change (Zott, 2003 apud Duchek, 2013).

Zollo & Winter (2002) propose an extended operational definition, thus a dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness (Noblet, Simon and Parent, 2011).

Amit and Schoemaker (1993) consider that capabilities "refer to a firm's capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end" (Duchek, 2013).

Acquisition is described as being the capacity to recognize, understand the importance of the external knowledge needed for the operations of an organization and obtain it (Lane & Lubatkin, 1998; Zahra & George, 2002 apud Noblet, Simon and Parent, 2011). The acquisition of new, specialized knowledge is a motivator for interorganizational collaboration (Hamel, 1991 apud Noblet, Simon and Parent, 2011), while acquisition in general is a generator of knowledge for an organization (Welsch et al., 2001 apud Noblet, Simon and Parent, 2011). Acquisition can occur as a result of

investment in research and development or through previous knowledge (Noblet, Simon and Parent, 2011).

Assimilation refers to a business's capacity to integrate external knowledge using routines and processes that allow it to understand, analyze, process and interpret information obtained from external sources. Thus, the number of publications where an entity makes reference to research carried out by others could be used to determine its success in this area (Zahra & George, 2002 apud Noblet, Simon and Parent, 2011).

Transformation is a company's capability to develop and refine the routines that facilitate combining existing knowledge and the newly acquired and assimilated knowledge. This goal can be achieved by the addition or suppression of knowledge, or the reinterpretation of existing knowledge, which requires two fundamental processes: internalization and conversion. Authors suggest that an indicator of a company's degree of success in transformation could be the number of ideas or research projects centered on new products (Zahra & George, 2002 apud Noblet, Simon and Parent, 2011).

Exploitation is an organization's capacity to competitively use new external knowledge to achieve its organizational goals (Lane & Lubatkin, 1998 apud Noblet, Simon and Parent, 2011). Routines create an environment that allows companies to refine, extend and leverage existing competencies, or develop new ones by incorporating acquired and transformed knowledge into their operations. Researchers propose using the number of patents obtained or new products announced as an indicator of a firm's degree of success in this area (Zahra & George, 2002 apud Noblet, Simon and Parent, 2011).

The review of previous empirical studies of absorptive capacity illustrates the need to further advance research in this area. Previous methods of measurement do not consider the complexity of the concept and hardly recognize its routine-based character. Future analysis of knowledge absorption practices, indifferent firms and industries can make important contributions to understand better the absorptive capacity and indicate how to capture the complex construct empirically. Also, particularly with regard to the implementation of innovative initiatives and the successful management of absorptive capacity, further research can offer valuable implications for practitioners (Duchek, 2013).

Referring to the characteristics identified by Zahra & George (2002), and after conducting a review of the literature, Noblet, Simon and Parent (2011) have grouped together in Table 1 the variables that can be associated with each characteristic.

The need to be competitive determine companies to implement business intelligence systems in order to optimize the decisional process. While many large enterprises have adopted analytics technologies such as business intelligence (BI), performance management (PM), and predictive analytics, factors like costs and risks have caused small and medium companies to adopt these technologies far more slowly. When senior leaders of small and medium companies invest in analytics tools, they improve operating results by enabling managers to make decisions that are more fact based and data driven (Nucleus Research, 2011). Even though business intelligence systems have seen an increased adoption rate in Romania lately, it is still at a very low level (Manager.ro, 2014).

Researchers have investigated how managers may promote absorptive capacity by creating internal knowledge stocks, but few have focused on the distribution of this knowledge within the company and the role managers play in administering information to organizational units (Lenox and King, 2004). This is especially important for IT specialists when it comes to designing, developing presenting new reports for a requestor or department.

Lenox and King (2004) find that managers can directly affect a company's absorptive capacity by providing information to potential adopters in the entity. Thus, information provision is most useful when an organizational agent has little information that directly relates to a new practice, but a great deal of information that is moderately related to this practice. On one hand, the ability of managers to improve the absorptive capacity of their companies by actively providing information suggests that the advantages of absorptive capacity will be short-lived. On the other hand, their results show that information provision cannot fully replace prior experience. The ability of managers to provide information and the ability of individuals within the entity to assimilate that information is depending on experience with related practices (Lenox and King, 2004).

Research methodology

This article presents an insight of the drawbacks in attaining performance by employing BI and developing absorptive capacity encountered in 10 large companies in Romania. The sample population consists of large companies with complex information systems, advanced IT competencies and thousands of clients, using real BI solutions, not only reporting tools, or Excel. For the companies in this category reporting is mandatory and optimal decision making implies using a BI solution. Further supporting the choice of the sample is the fact that small companies regard BI tools as expenses rather than investments

and encounter difficulties in implementing and maintaining a BI solution.

In this study the targeted population consists of companies that have implemented Business intelligence systems that produce reports used in the decisional process. The businesses selected in the study are large companies, operating with huge amounts of data, belonging to activity domains as insurance, banking, telecommunications, services and oil industry. The study mainly depends on data gathered through semi-structured interviews conducted with business analysts and developers in the IT department.

Since the information was obtained from professionals that have different responsibilities and areas of expertise, a few differences regarding the information offered were encountered, which resulted in many cases in incomplete data. Missing information was dealt with either by ignoring it in the analysis, or by returning to the source of data or by supplying default information according to the theoretical framework.

The study investigates the factors that are most probable to contribute to enhance the capacity of the entities to apply the new knowledge that BI produces for organizational success and competitiveness. To achieve this objective, a qualitative approach to research was chosen, in order to comprehend the Romanian environment regarding BI adoption and to identify and apprise the specific and contextual factors. The researcher had the role of visitor, for conducting interviews, or participant, as an IT professional in a company using BI technologies.

Information was gathered through individual in-depth semi-structured interviews and conversations with professionals involved in developing and implementing BI solutions, and observational techniques, by taking notes of internal aspects observed.

Through the in-depth investigation it was aimed to describe and comprehend the reasoning, processes, impact on the decisional process and the whole activity. This technique was chosen because it is the most appropriate to obtain detailed declarations on the following themes: the characteristics of the BI information system, the implementation process and changes involved, the data integration, analysis and reporting practices, and improvements in decision making support and the business activities.

There have been drawbacks as direct questions were avoided and certain information was not revealed in several cases, as companies in Romania are skeptic about transparency and disclosure. Thus, the semi-structured in-depth interview is the most effective technique as it allows the interviewed person to speak freely.

Main drawbacks regarding BI are the insufficient or heterogeneous procedures, poor BI

and strategic planning alignment, low technical interest of management, high costs, limited technical BI competencies of the IT human resources, and very long ongoing BI/DW implementation processes.

Business Intelligence adoption in Romania

The companies from the banking sector that were interviewed started implementing real BI solutions early in 2005 motivated by the competitive advantages that can be obtained and the acknowledgement of the risk that competitors are making such investments and are capable of faster reactions, manage the business better or respond better to changes in the market, and, as a result, probably have better results. Banks rely on a custom developed core-banking IT system that integrates BI tools. Nowadays, five out of top eight largest banks in Romania use a BI system provided by Oracle, which was chosen because they already used a DBMS based on the same technologies.

Banks started reporting activities since 1997-1998, but only later they started employing ETL tools in order to integrate and aggregate data coming from agencies and subsidiaries. The huge amount of data is denormalised up to the 2nd normal form and stored in a separate data warehouse, characterized by high throughput and low concurrency. The data warehouse is subject to performing data modelling and data analysis calculations, like aggregations, correlations, and forecasting, compiled in the form of cubes that allow drilling up and down. The cubes, in the last phase, are used in generating reports on different levels of generalization of specificity. The BI activities are usually the responsibility of a separate team in the IT department, which can comprise up to 80 employees responsible for developing internal applications and BI tools.

The company in the oil industry began using BI tools in 2007, in the process of aligning the Romanian branch with the rest of the Group. The know-how came from foreign management that formed reporting specialists with BI skills that could manage OLAP cubes, reporting based on the cubes and data consolidation. Over the time, the companies have started using more DBMS and BI systems, specific to each business division or each department, which raised issues regarding data integration and consolidation.

Companies using multiple business intelligence (BI) tools for reporting and analysis throughout the enterprise encounter warning indicators like debates on which figures and reports are correct, use of spreadsheets for adjusting numbers to be correct in certain reports, alignment debates with regards to data, metrics and algorithms to be used for specific reports. Some of the less visible costs of using multiple BI tools across an enterprise include: budgetary strains; resource constraints;

long delays in creating or modifying BI applications; redundant or conflicting efforts; overlapping hardware and infrastructure; the inability to develop thorough BI skills; business users spending more of their time gathering data than analyzing information; and having information quality compromised by inconsistent implementation of business metrics, rules and transformations. One of the key risks of maintaining multiple BI systems is that inconsistent information may have a negative impact on business judgment, resulting in a much higher total cost of ownership (TCO) for BI tools (Sherman, 2009).

In the company interviewed, the main BI solutions employed were SAP, for accounting, tax and legal activities, Oracle Hyperion Financial Management, exploited specially by the financial departments, and IBM Cognos TM1, used extensively by the controlling departments. Additionally, in corporate solutions departments TIBCO Spotfire Analytics is utilized, while Excel is used concurrently for consolidation and reporting.

In such cases, BI applications need to be considered as an entire BI portfolio in order to appraise the absorptive capacity from an enterprise perspective and understand the improvement opportunities, aspects of effectiveness and efficiency, and benefits associated to specific practices.

In the company from the telecommunications industry there are huge amounts of data to be handled, from clients and operations to technical and infrastructure related data, most of which being connected in real-time. In this context, even a small improvement in data management efficiency and integration of systems will have a significant impact on company returns and companies need to take into consideration modelling different scenarios to address the requirements related to marketing, finance, customer services and innovations, sales and technical implementation, and the possible impact of upcoming technologies.

The analyzed company is using many IT systems for specific parts of its business that are partially integrated, and has difficulties obtaining new information from its data. For the financial and accounting activities the company uses Oracle technologies and only recently implemented SAS Enterprise Business Intelligence, chosen mainly because they already used SAS customer relationship management applications. The company commits many resources and time to data analysis, segmenting, targeting, positioning and reporting, but uses a complex portfolio of applications that withhold the operational business flow from keeping the pace with the customers' requirements and the market trends, and negatively affects profitability.

The company has been hesitating to set an effective BI environment, with appropriate architecture, due to expected high costs and long implementation cycle that many BI solutions require. In this context, the challenge for increasing the absorptive capacity is to make the BI environment an integral part of the decision making process and to gather efficiently all stakeholders' information requirements.

The companies in the insurance sector had early interests in BI tools, focusing initially on reporting. BI systems started being used in 2005 in this sector, with the advent of MS SQL Server 2005 Business Intelligence Development Studio (BIDS). At the beginning, developers used stored procedures in SSIS as they lacked training on the features offered by the tool, subsequently appealing to SSIS tasks. The steps of BI workflows are acquiring data from various files and applications, introducing data in staging tables, processing data, denormalising, creating cubes (possibly using data mining), and drawing reports, according to business requirements.

To move information from OLTP to OLAP, these companies generally used SQL Server Integration Services (SSIS), while SQL Server Analysis Services (SSAS) is employed for creating cubes and data mining. This system is expected to cover the needs of reporting in order to support decision-making. Information users, especially managers, require data mining, the necessary tools are available, but there are very few developers with the essential skills. SQL Server Reporting Services (SSRS) is the preferred tool for designing reports, which were wizard generated or custom created by a developer using SQL. Another tool used is Report Builder, for users who only know business concepts and had access to data.

Of the technologies offered by Microsoft, the most used BI tools are SSIS and SSRS, while for SSAS there are very few requests. SSIS is preferred because it provides the possibility to work with various sources, directories, FTP, to launch packages, tasks and other jobs on the database, to make data imports and exports, and directly supports C # code through which any request can be met. SSRS is used very much as it can quickly and easily generate professional reports, which can be exported. Data for reports are generated, calculated, verified in a separate project, and then included in reports.

Half of the companies preferring Microsoft technologies, use SSIS only for integrating data from multiple sources to multiple destinations, SSAS being generally substituted by custom application modules or through making necessary changes directly on the database. SSIS is especially necessary for working with multiple files, databases of various types and with several DBMS.

Most commonly used BI systems are provided by Oracle and Microsoft, according to what has been previously used in the company and the quality (skills and experience) of analysts and developers. By activity domain, banks and insurance companies employ BI systems in the highest proportion, implementing either custom created BI tools or systems provided by Microsoft and Oracle. Purchasing decisions do not depend on the quality of tools and services offered by major suppliers of IT solutions, but rather on the needs and resources of the company or group.

Generally, if a company started using solutions provided by a supplier, and it has employees accustomed to certain technologies and applications, it will choose a BI system from the same provider. Another general tendency is to use SAP for accounting activities, besides other applications and BI solutions. Furthermore, companies keep and periodically update a documentation set for databases and IT related operational flows and procedures, but for the BI solutions usually there is no documentation, as it is used by small groups.

The development of BI projects is a continuous process, there are constant requirements for adaptations, improvements and creating new packages, cubes, reports, etc. The greatest challenge encountered in implementing a new solution is data quality, as data import problems appear and need specific treatment.

The BI system is perceived as indispensable to managers, essential to data management, decision-making support, activity monitoring, analyzing current economic and performance indicators, and business forecasting.

The main problems identified in BI tools utilization refer to the lack of a generally accepted BI strategy, OLAP dimension tables, as they should not become extremely large for the sake of data relevance, and reporting based directly on OLTP databases. Reporting requirements include data elements, not information specifications for decisional support, according to the strategy of the business. Reports are generally simple, the equivalent of SELECT queries, specific to a department, company or group, and 90% of them do not involve the use of BI tools, as they are generated directly from the DBMS or ERP application. Thus, requestors end up performing ad-hoc reporting based on the available data and tend to return to using Excel, although BI technologies are available, because they are uncertain of the information they will need or uncomfortable with the new system, and, as a result they take the responsibility for reporting and limit the absorptive capacity that can be attained by this mean. These practices are a sign of low productivity and high information quality risk.

Also, companies already have applications that run well and if something extra is desired, for

financial reasons they prefer making a single improvement or report instead of initiating an entire BI implementation project. "Applications currently reached hundreds of thousands of report requests and are overwhelmed, but it's already too late, as companies should invest too much in order to optimize the entire process" says one of the business analysts. In order to settle reporting requests, interviewed companies prefer to hire staff for reporting activities and improve the application currently used, rather than implement a new IT system that serves their needs better. This process would require several large phases, which could extend over more than a year: extracting all data from all sources, process them so as to facilitate reporting, creating a data warehouse and producing the reports.

For companies that turn to outsourced IT services, BI projects include more systems, chosen according to the skills and experience of developers who prefer technologies to which they are more familiar and consider easier to use.

In Romania, several large companies have implemented BI systems, the rest, substituted a real BI solution with various reporting tools, Excel being the most used, considering BI investments unnecessary. This happens because BI tools are not known, there are very few subject matter experts and requirements appear less important and extensive to necessitate such efforts. Basically, companies start from the applications they already have, and integration software is used only if necessary, in order to move on FTP, copy or retrieve data, otherwise, unless absolutely necessary, developers prefer to work with well-known or cheaper technologies.

Conclusions

According to the dimensions of absorptive capacity defined by Noblet, Simon and Parent (2011), in Romania there is a medium potential capacity. The shortcomings in achieving higher acquisition capacity relate to the type of new knowledge, collaborations and alliances, lack of motivation, little R&D activity, personnel turnover and participation in decision-making.

The assimilation and integration of external knowledge is also under-achieved as the management support is average and there are no research or practice communities. Only one of the interviewed companies has registered and/or pending patents. Routines are questionable as there are practices unofficially accepted, which aim to increase coordination capacity and maintain workforce stability.

The achieved absorptive capacity is related to the alignment process imposed by the foreign headquarters, which provided routines, applications, know-how and consultancy. This policy of copying the activity routines supports

reporting, forecasting, conciliation and alignment processes, but not developing of new applications, diversification of methods, patterns, templates or tools used, and the number of new ideas cannot be considered a variable of impact, as ideas are not shared and widely adopted.

The exploitation capacity of new knowledge refers mainly to achieving the goals of the company, sometimes by speculating solutions and / or using officially unacceptable practices for short term solutions, rather than the best practices, because companies hardly manage to apply the external knowledge timely. The protection systems have average performances, as there are few points in the data flow where the access to data is not controlled.

According to the European Commission (2014) Romania has one of the lowest competitiveness levels in the EU, the main challenges being employment in knowledge-intensive activities, under-developed business environment and low support of research and development. The research and innovation system is presented as highly fragmented, with feeble links between education, research and enterprises. Rapidly changing, uncertain regulatory framework and cumbersome bureaucracy have a negative impact on businesses.

Empirical research would be critical in helping stakeholders understand how companies become good at using Business Intelligence to enable and enhance their absorptive capacity and sustain economic competitiveness. The case studies can be used for further research on the strategic use of BI, which should include legal and economic aspects of inter-organizational relationships, outsourcing knowledge, research and development.

Companies have the potential to enable and enhance absorptive capacity through BI adoption, as a mean for better performance, and structurally reforming the actual system, so as to invest in education and a BI system, integrate data sources in data warehouses/marts, enhance data quality, involve research and development activities, secure information, effectively support the decisional process, and develop modules for assimilating external knowledge and discovering new combined knowledge.

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Table 1
Dimensions of absorptive capacity, with associated variables

<i>Dimensions</i>	<i>Key characteristics</i>	<i>Associated variables</i>
Acquisition	<ul style="list-style-type: none"> • Recognition and understanding of the new external knowledge • Appreciation of its value, and acquisition of the external knowledge 	• External sources background
		• Nature of external knowledge
		• Type of new knowledge
		• Prior investments
		• Prior experience
		• Acquisition of licenses
		• Contractual agreements
		• Alliances and other interrelationships or joint ventures
		• Actors' motivations
		• Organizational culture
		• Common and shared language
		• R&D intensity
		• Familiarity with organizational problems
		• Personnel turnover
• Participation in decision-making		
• Ability to detect opportunities in the environment (expectation formation)		
• Position of the firm in the network		
Assimilation	<ul style="list-style-type: none"> • Assimilation of the external knowledge and its intrinsic value • Integration of the external knowledge 	• Routinization
		• Coordination capacity
		• Personnel turnover
		• Number of patents pending
		• Number of research and/or practice communities
		• Management support
Transformation	<ul style="list-style-type: none"> • Transformation of the knowledge through the development of routines • Combination of existing knowledge with assimilated knowledge • Addition or removal of knowledge to allow new interpretations • Internalization and conversion of information 	• Development of new products
		• Diversification
		• Routines for knowledge creation
		• Number of new ideas
Exploitation	<ul style="list-style-type: none"> • Application of the assimilated external knowledge • Achievement of organizational goals • Creation of new knowledge by integrating acquired and converted knowledge 	• Number of patents filed
		• Number of new products
		• Protection systems

Source: Noblet, Simon and Parent, 2011