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Svetlana
NEMITKO

The Factors of Satisfaction of Business Intelligence Information Needs

SUMMARY OF DOCTORAL DISSERTATION

Social Sciences,
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CONTENTS

INTRODUCTION	6
1. THEORETICAL ASPECTS OF BUSINESS INTELLIGENCE ..	17
1.1. Business intelligence concept in literature	17
1.2. Business intelligence properties	18
1.3. Business intelligence implementation and use features.....	23
2. THEORETICAL ASPECTS OF SATISFACTION OF BUSINESS INTELLIGENCE INFORMATION NEEDS	25
2.1. Theoretical aspects of information needs	25
2.2. Insights	27
2.3. Identification of key factors of satisfaction of business intelligence information needs	28
2.3.1. Communication. Sharing of information	28
2.3.2. Organisational, information and analytical culture ..	30
3. RESEARCH ON FACTORS OF SATISFACTION OF BUSINESS INTELLIGENCE INFORMATION NEEDS	33
3.1. The concept of the main research	33
3.2. Analysis of the data obtained during research	35
3.2.1. The analysis of technological factors and their impact on advanced informing	36
3.2.2. The analysis of human factors and their impact on advanced informing	39
3.2.3. Advanced informing	45
3.2.4. Business intelligence culture	48
CONCLUSIONS AND SUGGESTIONS	57
REZIUMÉ	60
LIST OF PUBLICATIONS	70
INFORMATION ABOUT THE AUTHOR	71

INTRODUCTION

Relevance of the topic

Information has always had particularly important and often critical role in business or any other rational activities. The spread of information technologies has become a driver of information activities and has developed its potential. Proper use of information and communication technologies currently available on the market enables the strengthening of business agility and viability in the context of volatile activities.

According to SAP, the global leader and manufacturer of Enterprise Resource Planning (ERP) systems and Business Intelligence (BI) tools, the society is currently entering the era of Digital Renaissance, i.e. intensive intelligent activities and creativity. Digitalisation is taking place at such a rapid pace that 72% of the chief executive officers believe that the nearest three years will be more critical to their business operations than the past fifty years. However, only 5% of the respondents realise that business digitalisation has already become the basis of a competitive edge (Howells, 2017).

In the contemporary business world, a rapid and, at the same time, well-designed and grounded response to the environment has become the essential factor in determining competitive advantage and often the main condition for further development. In these circumstances, a business community has been facing new challenges, i.e. not only to be informed but to be flexibly and thoroughly informed as well as to notice preventively the valuable signs of the changes in the environment that have an impact on the results of business decisions. On the basis of the concept of dynamic capabilities (Teece, 2014), the capacity of an organisation to recognise such changes of the external environment earlier than its competitors and to rearrange effectively the configuration of its resources is a true source of a durable competitive edge in a rapidly changing external environment. Such intelligent informing, the product of which constitutes valuable business insights, could be referred to as advanced informing (Skyrius,

et al., 2018), i.e. information activities that support and develop the capacity of an organisation to recognise changes in the contemporary competitive environment earlier than its competitors (Teece, 2014). This way, advanced informing has become an essential prerequisite to ensure viability of operations in the contemporary turbulent business environment. Nevertheless, despite the fact that the market is full of information technologies suitable for the fulfilment of this prerequisite, advanced informing has turned out to be a difficult task and has shaped a presumption for the posing and investigation of a corresponding scientific problem.

The dissertation makes a presumption that the organisations which respond to business intelligence information needs (hereinafter referred to as BI information needs) and which have:

- succeeded in gaining considerable or significant benefit for business;
- solved business problems through business intelligence;
- encountered fewer factors hindering business intelligence implementation;

have made use considerably of advanced informing possibilities in creating value for business.

The scientific problem and the level of its investigation

During the past two decades, the sphere of business intelligence has undergone dynamic growth – from static reports generated by ERP systems to the ones that enable automated high-reliability forecasts based on unlimited number and large-scale data source tools. Nevertheless, such questions of proper informing as, for instance, ‘Does the organisation receive the information that is necessary to satisfy its business information needs?’; ‘Does the received information presuppose suitable insights corresponding with the strategy of the organization and the actual market situation?’; ‘Does the existing business intelligence culture promote the formation of proper insights and their quality transformation to business value generating decisions?’ have remained open until now.

Today, the market of information technologies is full of various business intelligence (hereinafter referred to as BI) tools and

technologies that can satisfy the BI information needs of different-size, varying financial capacity organisations operating in different spheres. However, according to the statistics, most of BI projects have failed to create the anticipated business benefit and are considered as unsuccessful owing to various technological as well as human factors. The failure of the implementation and use of BI systems and technologies in the activities of an organisation is not the outcome of improper satisfaction of BI information needs. This is just an indicator presupposing the analysis of the factors of satisfaction of BI information needs as a scientific problem. BI technologies should serve as a business success driver; however, the research has shown that organisations fail to achieve the set targets and to create added value in 70-80% of cases (Howson, 2008; Davenport, Harris, Morison, 2010; Wixom and Watson, 2010); considerable attention has been paid to the BI implementation and use problems and failures in scientific literature (Arnott, 2008; Ahmed, 2014; Gurjar & Rathore, 2013; Olszak, 2016; Ortiz, 2014).

The sphere of business information is investigated from various perspectives but most of the investigated aspects have maintained a technological connotation. On the other hand, the field of business information intelligence from the perspective of information users has not been widely researched.

Business intelligence scientific research topic has been shifting from technological factors to the unlocking of the potential of the soft or human factors (including but not limited to organisational, management factors) as well as to the overcoming of the obstacles impeding the realisation of such potential (Olszak, 2016; Yeoh and Koronios, 2010). Nevertheless, the human factors that are so important for advanced informing have been insufficiently researched.

Proper organisational culture is increasingly identified as one of the main and increasingly visible factors that has an impact on the success of the implementation of business intelligence systems and satisfaction of BI information needs (Sangar and Iahad, 2013; Yeoh, *et al.*, 2008; Watson and Haley, 1997); however, BI culture as a factor of satisfaction of business intelligence information needs has been scarcely researched.

Practical need has also promoted scientific interest in the factors of satisfaction of business intelligence information needs. However, practical experience in real life is limited to the know-how of specific business entities and their experience related to specific projects. Meanwhile, a scientific study of the issue enables a global and deep insight into the cause of the problem, clarification of the patterns characteristic of the studied environment and determination of hidden circumstances.

Taking into the account the listed assumptions for the formulation of the scientific problem, the scientific problem analysed in this dissertation constitutes a need to get closer to the answer to the question that is vitally important to organisations operating in contemporary highly dynamic environment, ‘What factors of satisfaction of business intelligence information needs are preconditions for the improvement of the quality of insights and decisions through advanced informing?’.

The object of the research is the system of the factors of satisfaction of business intelligence information needs.

The aim of the research is to identify those factors of satisfaction of business intelligence information needs, which promote advanced informing.

To achieve the aim of the research the following tasks are set:

- To analyse the level of investigation of business intelligence information needs in scientific literature;
- To define and ground the most relevant problem areas of business intelligence;
- To determine the factors of satisfaction of business intelligence information needs as well as their links in the context of dynamic business environment;
- To determine the factors of satisfaction of business intelligence information needs that promote the generation of business value through advanced informing.

Dissertation research methods

The research methods employed in the dissertation were selected on the basis of the scientific research methodology, after a thorough

analysis of social science research methods and the aspects of their applicability.

The research on the factors of satisfaction of BI information needs is attributed to the sphere of information systems and the scientific problem is closely related to the human factors. Taking this into consideration, the in-depth interview and survey methods were selected for both exploratory and main research as directly reflecting personal opinion and featuring an individual presentation of facts. This way, both types of research can be attributed to combined research as they include qualitative and quantitative research methods.

Taking into account the recommendations on the application of research methods in scientific literature as well as the experience gained during the exploratory research, the main research was conducted in the following order of research method application:

- The analysis of the sources of scientific literature, information structuring and summary;
- The survey of experts. The main goal of employing this method was to collect the data which could help to specify and elaborate presumptions and questions; to identify the variables of the research; and to maximally define possible answers to the research questions. Five experts were surveyed;
- The survey in the form of a questionnaire and interview included the following:
 - The preparation of the questionnaire,
 - The testing of the questionnaire through an online survey (an initial evaluation of the questionnaire was performed by surveying 10 respondents),
 - The testing of the questionnaire through an interview (5 respondents were surveyed),
 - The improvement of the questionnaire,
 - The survey online and on the phone. The survey was conducted in cooperation with IT SUMMIT conference organiser (<http://itsummit.lt/bi-day-16>). The survey was carried out by a professional survey centre. The respondents could answer the questions by logging in to the questionnaire

online or their answers could be entered by the survey centre staff during a telephone conversation. The questionnaires were anonymous.

Particularly great attention was paid to the preparation and testing of the main research questionnaire due to the specifics of the respondents, i.e. high busyness of the respondents, their reluctance to disclose the information that is critical for the success of their business, the lack of possibility to reach the respondents through the means of mass media, and the need to adjust the questionnaire content with the persons responsible for public relations and communication in the companies.

The object of the main research is the system of the factors of satisfaction of BI information needs, which – just like any other system of factors defining a phenomenon or object – can be of varying levels of complexity, from a very simple to a very complex, depending on the number of the constituent elements and the links among them. Taking into consideration the fact that the probability of establishing hidden, new and valuable relationships and patterns through the analysis of low complexity systems of factors is low, the respondents whose BI maturity can be attributed to the first or second level were eliminated from the research. Average and high complexity systems of factors of business intelligence information needs are typical of the business entities with business intelligence maturity of a higher than average level (third, fourth, fifth levels based on different classifications).

Thus, the population in the context of this research is the first and second level managers of the business companies operating in Lithuania, the business intelligence maturity level of which is higher than average, as they normally are the main sources generating BI information needs and are also the people in charge of the regulation of the trend of satisfaction of BI information needs in an organisation as well as the evaluation of the results of satisfaction of such needs.

There is no possibility to establish unambiguously the level of business intelligence maturity with the help of only the public information sources and, respectively, to determine precisely the population size; therefore, a non-probability sampling method was applied. The sampling was formed purposefully, presuming that the

selected elements correspond with the target audience. The initial sampling was formed within the limits of professional contacts of the researcher as well as within the circle of IT SUMMIT conference participants who agreed to take part in the research carried out by IT SUMMIT. Further sampling was increased on the 'snowball principle,' i.e. the respondents listed a few more potential respondents who could provide the necessary information. Up to 200 respondents were planned to be surveyed. 207 respondents were actually surveyed.

Relative novelty of the research field as well as the striving to detect important features and relationships determined the choice of combined research.

The data was processed with the computer software SPSS Statistics V26 and IBM SPSS Modeler 18.2. The data received during the research was analysed with the help of the statistical analysis method, neural network analysis method, web diagram method and CARMA analysis method. Several research methods were selected to neutralise the bias and errors of individual research methods.

The following difficulties and limitations were experienced during the main research:

- Difficulty in reaching the respondents who correspond to the nature of the research and meet the requirements of the target group;
- The reluctance of the respondents to share the information necessary for the research that is confidential and critical for their business success;
- The impossibility to know in advance the level of business intelligence maturity of a company-respondent. There was a risk of collecting the data that is not valuable for the research and that would subsequently have to be eliminated.

The structure and scope of the dissertation

The dissertation was structured according to the aim of the research as well as the intended tasks. It is comprised of the introduction, three body parts, conclusions, bibliography and appendices. The

dissertation consists of 184 pages and includes 68 tables, 20 figures and 2 appendices. 179 references have been used.

The logical structure of the dissertation is depicted in Figure 1, which represents the implementation order of the tasks set to achieve the aim of the dissertation.

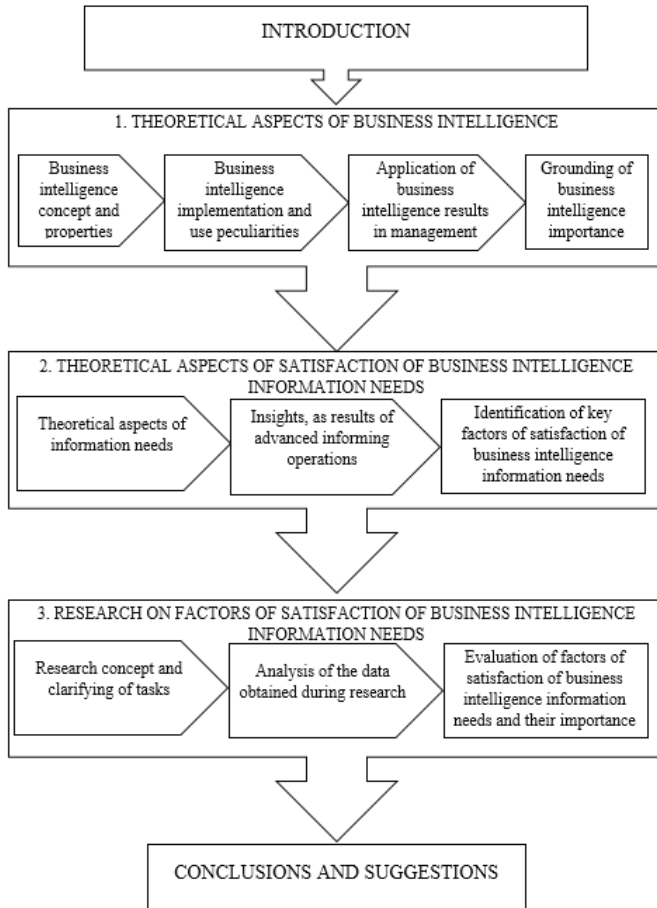


Figure 1. **Logical structure of the dissertation.** Compiled by the author

The first chapter analyses the attitudes towards the concept of business intelligence prevailing in scientific and practical literature as well

as identifies the goal of business intelligence, i.e. advanced informing. The chapter also studies the features of business intelligence that have an impact on the outcome of satisfaction of BI information needs, i.e. multidimensionality, maturity and agility; this dissertation part presents the attitudes of various authors towards the role of business intelligence, the related tools and employed technologies and the particularities of their implementation and use; it describes the application of business intelligence in management activities, and includes the justification of the importance of the selected research object and research scientific problem. Following the review of earlier studies as well as the classification of the factors of satisfaction of BI information needs in scientific literature, the two main factor groups are singled out – technological and human factors.

The second part of the dissertation focuses on the concept of BI information needs, the process of satisfaction of BI information needs and its outcome – an insight. The chapter also outlines the main factors of satisfaction of BI information needs: communication, information sharing, and culture, which, based on the results of the analysis of scientific literature, presuppose the encouragement of advanced informing.

The third chapter of the dissertation describes the idea and concept of the research as well as the processes of the research construct formation and research task clarification. It includes the analysis of the results of the research on the factors of satisfaction of BI information needs as well as the evaluation of the factors of satisfaction of BI information needs and their importance.

The conclusion part consists of the summarised and structured conclusions of the carried out analysis of scientific literature as well as the analysis of the results of the two types of research (exploratory and main).

Practical importance of the dissertation

The problems analysed in this dissertation were caused, on the one hand, by factual practical circumstances to employ the potential

of advanced technologies and, on the other hand, by the necessity to seek advanced informing which would enable organisations to develop successfully in the contemporary highly dynamic business environment. The practical importance of the topic of the factors of satisfaction of BI information needs is also proved by the fact that the main research of the dissertation was initiated in cooperation with IT SUMMIT organisation that unites Lithuanian business organisations, the managers representing such organisations, and business analysts. The research results were approved in the most important Lithuanian practical-scientific business intelligence conference “BUSINESS INTELLIGENCE DAY” and constituted the main topic of the conference.

Such interest of practical community in the problems of satisfaction of BI information needs and the engagement of scientists to solve them has been caused by the need to develop the potential of the value created by business intelligence to an organisation. Even if the implementation and use of business intelligence does not give any special value insights to an organisation, it still plays an important catalyst role in the development of information activities of the entire company. Business intelligence promotes more purposeful direction of information activities in an organisation and supports the satisfaction of information needs. Ideally, business intelligence enables the achievement of advanced informing, which provides an organisation with a more precise and deeper understanding of the environment, evaluation and, thus, promotes better performance results.

The defensive statements of the dissertation

The following main assumptions were planned to be investigated during the research:

- The technological factors of satisfaction of BI information needs presuppose higher-level analytical activities; however, taken alone, they do not ensure the goal of satisfaction of BI information needs, i.e. advanced informing.

- Organisational, management, social and psychological aspects (human factors) have a great impact on the satisfaction of BI information needs.
- Sharing of information, insights, and experience is one of the critical factors of satisfaction of BI information needs and presupposes the achievement of advanced informing.
- Well-organised information processes and supported human factors in an organisation (cooperation, sharing of information and insights, horizontal communication) lead to better problem-solving and greater value for business.
- There is a factor of business intelligence culture (regarded as part of organisation and information culture) that promotes the satisfaction of BI information needs through increased business value due to advanced informing.

The approval of the dissertation research and publication of its results

The research results and dissertation material were presented at scientific and practical conferences:

- *The Relation between Lessons Learned and the Development of Intelligence Culture in an Organization*. The Economics, Finance, MIS & International Business Research Conference, London, Great Britain, 09-07-2015 – 12-07-2015.
- *RESEARCH: Business Intelligence Experience and Problems in Lithuania, 2016*. Business intelligence conference “Business Intelligence Day”, Lithuania, 08-11-2016.
- *Factors Driving Business Intelligence Culture*. InSITE 2016: Informing Science + IT Education Conferences: Lithuania, 27-06-2016 – 01-07-2016.
- *The Support of Human Factors for Encompassing Business Intelligence*. InSITE 2018: Informing Science + IT Education Conferences: La Verne California, 01-07-2018 – 03-07-2018.

The results of the dissertation have been approved and published in five publications, which are presented in the chapter LIST OF PUBLICATIONS of the summary.

1. THEORETICAL ASPECTS OF BUSINESS INTELLIGENCE

1.1. Business intelligence concept in literature

The problem of satisfaction of BI information needs is attributed to the spheres of business intelligence and decision support. Business intelligence is the sphere of professional analytic activities specialising in the trends of information analysis and analytic technologies and oriented towards the optimisation of business processes and all business operations.

The results of the analysis of business intelligence definitions have shown that there is certain distribution of the attitudes of the authors towards business intelligence in scientific literature based on the strength of the emphasis on the technological or human aspect. Some authors (Loshin, 2003; Liebowitz, 2006; Evelson and Nicolson, 2008; Gartner, 2019; Davenport, 2005; Forester Research) highlight more technological nature of business intelligence, whereas the others (Ghoshal and Kim, 1986; Wang and Wang, 2008; Papadopoulos and Kanellis, 2010; Azvine *et al.*, 2006; Bogza, 2008; Wells, 2008; Atre and Shaw, 2004; Rouibah and Ould-ali, 2002) suggest analysing business intelligence more broadly, including, but not limited to, a set of methods, tools and technologies intended for the transformation of unprocessed data into the decision value for business. The latter authors underline the human factors encompassing the entire organisation: the management philosophy, the ability of an organisation to perceive, interpret and share information as well as the ability to learn and use effectively the information and insights so as to encourage and enable the organisation to function while creating value. The results of the analysis of scientific literature presuppose the idea that business intelligence is a complex phenomenon which involves technologies, processes and the diverse environment where it occurs. Meanwhile, the satisfaction of BI information needs is affected not by the technology itself but also by the movement of information, the quality of the

transformation process and the particularities of the interaction of environment constituents as well as the interaction with the exterior.

Scientific BI literature involves a lot of discussions to single out the features of ordinary and intelligent informing. In this work, the author supports the trend that all business intelligence informing functions are attributable to intelligent informing as, based on the definition, business intelligence increases awareness, enables the formation of new insights; thus, according to its nature, business intelligence informing is intelligent, irrespective of the formulation of a business intelligence question.

The main divide between ordinary and intelligent informing is the creation of an insight, its integration into the knowledge of an organisation and its use on an organisational and business scale. Such intelligent informing could be referred to as advanced informing (Skyrius, Nemitko, & Taločka, 2018). In different contexts, the BI information needs of various organisations, their structural units, teams and specific individuals differ, whereas business intelligence is the process that encompasses them all – from simple to complex ones.

Nevertheless, to summarise, it can be stated that the main aim and aspiration of business intelligence is that particular advanced informing that provides high value to business activities. The divide between ordinary and intelligent informing depends on the level of complexity of information needs.

Ordinary informing involves the sphere from simple to average complexity information needs, whereas intelligent informing is directed at the satisfaction of average and high complexity information needs.

1.2. Business intelligence properties

This chapter analyses the most important business intelligence properties, properly employed potential of which promotes satisfaction of BI information needs while seeking advanced informing, i.e. multidimensionality, maturity and agility of business intelligence.

Multidimensionality is a very important feature of business intelligence – from the monitoring of routine business operations to

the analysis of large not everyday problems (Kamal, 2012; Davenport, 2015); from the efficiency of internal processes to broad insights at macro level (Dykes, 2016); from dry figures and facts to the information presented in rich contexts (Warner, 2014). Such multidimensionality of business intelligence enables an organisation to work towards uniform understanding of the status of activities, opportunities, possibilities and risks (Skyrius and Rėbždaitė, 2011).

Davies also emphasizes the importance of effective communication and information sharing in the context of multidimensionality by singling out the need to use information from various data sources and to connect the fragments of received information into a consistent picture constituting the basis for decision-making (Davies, 2004). Irrespective of how information technologies are employed, organisations have to ensure ample opportunities for interpersonal interaction and sharing of experience in order to form social connections and communication mechanisms enabling the exchange of deeper insights (Zack, 2007).

Proper management of this complicated, by its nature, property of a phenomenon or process – multidimensionality – is only possible when an organisation reaches a certain business intelligence maturity level. Business intelligence maturity level describes the ability of an organisation to generate value for business through business intelligence. The business intelligence maturity model consists from a sequence of maturity levels demonstrating a probable or typical evolution of an organisation and business intelligence process as separate stages (Becker, Knackstedt, Pöppelbuß, 2009). Certain maturity models are oriented towards technical aspects, while the others are presented from the perspective of business activities (Chuah and Wong, 2011).

Another key property of business intelligence which – based on the results of the analysis of scientific and practical literature – has an impact on the success of the use of business intelligence in an organisation as well as on the creation of value for an organisation is the agility required by business intelligence. In order to ensure sustainable success in changing environments, executives have to be able to coordinate their strategies as well as to implement such strategies relatively quickly, within an adequate response-to-changes time (Wensley and Stijn, 2007; Gandossy, 2003). Business

and public organisations are forced to respond quickly to changing market conditions and to be innovative. Such circumstances require organisations to be agile, to be able to make prompt strategic, tactical and operational decisions, part of which can be really complicated (Turban, Sharda, Delen, 2010). According to Zimmer *et al.* (2012), agility is the most important property in a dynamic environment.

According to Teece *et al.* (1997), a sustainable company has the capacity to perceive and form opportunities and see threats through the use of external and internal intelligent information; to exploit opportunities; to maintain competitiveness by strengthening, aligning, protecting and, if necessary, reconfiguring its material and non-material resources as well as using the internal organization intellect to the maximum. In the opinion of Rick, the only way to create an organization of infinite agility is to create the organisational culture that has a built-in capacity for agility. The creation of a culture of agility and flexibility is possible and should be the first strategic priority as it is the culture that shapes the organisation's ability to adjust in any direction and execute any strategy (Rick, 2015). In order to satisfy changing BI information needs, an organisation not only has to be agile and be able to adapt to a changing environment but also to become proactively smart. The results of the analysis of literature enable an assumption that better satisfaction of BI information needs – quality and proactive, i.e. advanced informing – would help an organisation to win time to respond to changing circumstances properly and more promptly compared to other market participants.

Business intelligence competencies acquired by an organisation are more resistant to the test of time, whereas technologies are rapidly changing. Therefore, an assumption can be made that the human factors are the source of agility and viability of satisfaction of BI information needs.

To generalise the results of the analysis of the scientific literature of this chapter, Table 1 presents the list of factors of satisfaction of BI information needs structured by the author based on the two aspects of satisfaction of BI information needs distinguished in the scientific literature, i.e. technological and human. Technological factors are grouped according to the grouping prevailing in the scientific literature:

data management; processing tools and technologies, availability to users (access). Meanwhile, the grouping of human factors is suggested by the author taking into account the nature of the researched scientific problem. Attention should be drawn to the fact that there are a lot of publications dedicated to technological factors in scientific literature and this table mentions only the sources that are most typical for the aims of the research.

Table 1. The factors of satisfaction of business intelligence information needs identified in previous research. Compiled by the author on the basis of the indicated sources.

Factor Group	Factors		Literature Source
Technological factors	Data management	Data collection and information consolidation methods.	(Loshin, 2003), (Liebowitz, 2006), (Gartner, 2019)
		Data management: variety, volume, storage, quality.	(Halper and Stodder, 2015)
		Data depth – level of detail, data granularity.	(Liebowitz, 2006), (Elliott, 2004)
		Data breadth – information integration across different systems to perform cross-functional analysis.	(Liebowitz, 2006), (Elliott, 2004)
	Processing tools and technologies	Process of transforming data into information.	(Loshin, 2003), (Liebowitz, 2006), (Evelson and Nicolson, 2008)
Availability to users (access)		Methods, tools and facilities of access to information of business users.	(Halper and Stodder, 2015), (Atre and Shaw, 2004), (Davenport, 2005)
		User control – direct autonomous access, or user pull, as opposed to specially prefigured and delivered content, or system push.	(Elliott, 2004)

Factor Group	Factors		Literature Source
Human factors	Arrangement of information processes	Process of transforming information into knowledge about business.	(Azvine, <i>et al.</i> , 2006), (Bogza, 2008), (Wells, 2008), (Davies, 2004).
		Business specialisation – narrow scope content for a specific function or business domain, as opposed to wide scope content encompassing key functions or processes.	(Elliott, 2004)
	Organisational, management	Information policy, security, privacy	(Halper and Stodder, 2015)
		Capacity of an organisation to perceive information and use it effectively.	(Ghoshal and Kim, 1986); (Rouibah and Ould-ali, 2002);(Wells, 2008), (Papadopoulos and Kanellis, 2010), (Overby, <i>et al.</i> , 2006), (Teece <i>et al.</i> ,1997), (Cohen and Levinthal, 1990)
		Competence, skills	(Halper and Stodder, 2015)
		Leadership	(Halper and Stodder, 2015)
		Strategy	(Halper and Stodder, 2015), (McMurchy, 2008), Teece <i>et al.</i> (1997)
		Resources	(Halper and Stodder, 2015)
		Perception of value	(Halper and Stodder, 2015)
		Business insights received by way of deep analysis of detailed data and consolidated information.	(Atre and Shaw, 2004); (Wang and Wang, 2008); (Bogza, 2008)
	Culture	Information culture	(Halper and Stodder, 2015); (Ghoshal and Kim, 1986); (Rick, 2015)
		Attitudes of people and motivation to better understand activities and environment.	(Ghoshal and Kim, 1986), (Wells, 2008)

The technological factors attributed to the data management group are not analysed in this dissertation as they have been studied in adequate detail by other authors and it is considered that these factors are fundamental for the satisfaction of BI information needs. The human factors (competence, skills and resources) are also not analysed in this work as the assumption is made that such factors are clear and necessary for the satisfaction of BI information needs. The other factors of satisfaction of BI information needs indicated in Table 1 are important for the research on the defensive statements and are developed further in this dissertation.

1.3. Business intelligence implementation and use features

After a detailed analysis of the causes of both successful and unsuccessful BI implementation and use, an assumption can be made that the process of formation and satisfaction of BI information needs is closely related not only to information technologies, i.e. a BI product, and their technical properties and infrastructure but is also largely influenced and directed by psychological and management, i.e. the human, factors of an organisation.

Yeoh and Koronios (2010) suggested grouping the critical success factors of business intelligence implementation into the following three categories: organisational aspects, process aspects and technological aspects. The organisation dimension encompasses the vision and business-related factors as well as management and leadership-related factors. The dimension of process includes the team-related factors, project management, methodological and change management factors. The technological dimension involves the factors related to data and infrastructure. To aggregate even further, the critical success factors of the implementation and use of business intelligence can be distributed into management and technological dimensions and spheres, depending on a stage of the implementation and use of business intelligence, i.e. prior to the implementation, during the implementation and after the implementation. In the opinion of several researchers (Sangar and Iahad, 2013; Olszak, 2016), the use of critical success factors help align new systems with business goals.

In order to clarify the factors of satisfaction of BI information needs and develop the dissertation topic, the author suggests grouping the BI implementation success factors into the following groups:

- The factors that are directly related with satisfaction of BI information needs (processes and the link with business (operations), competence),
- The factors that promote satisfaction of BI information needs in order to achieve advanced informing: strategy, management, change management, environment, project leader (regarded more broadly as a BI leader),
- The factors specifically related to a BI implementation project (project management, business intelligence users (project participants)).

The factors specifically related to a BI implementation project are not analysed in the context of this dissertation. From the factors that are directly related with satisfaction of BI information needs only the group of process factors was selected for further analysis, whereas competence was regarded as a basic and clear factor. All the listed factors that promote satisfaction of BI information needs in order to achieve advanced informing (with the exception of change management as this factor is of broader nature and is not directly related with the statements defended in this dissertation) were also selected for research.

Published researches confirm the assumption that BI is intended for satisfaction of higher information needs, whereas advanced technologies alone do not ensure that. To generalise the results of the analysis of scientific literature and previous studies in this chapter, a conclusion can be drawn that the authors analyse the problems of satisfaction of BI information needs from various perspectives which could be grouped into two groups of factors, i.e. technological and human factors. Moreover, it is important to note that irrespective of the fact that the human factors have been insufficiently researched, all the authors – including those who investigate the BI problems from the point of view of implementation of technologies – highlight and single out the importance of the human factors on satisfaction of BI information needs.

2. THEORETICAL ASPECTS OF SATISFACTION OF BUSINESS INTELLIGENCE INFORMATION NEEDS

The second chapter of this work analyses BI information needs, the theoretical aspects and factual circumstances of satisfaction of such needs; identifies the factors of satisfaction of BI information needs that are essential to advanced informing. There are a lot of scientific works on the topic of information technologies and business intelligence; however, it should be noted that one of the least analysed aspects of information management is the investigation of information needs. According to Choo, information needs arise from the problems, uncertainties, and ambiguities encountered in specific organisational situations (Choo, 2002). In the context of this dissertation, the terms *Information Needs* and *Business Intelligence Information Needs* are used as synonyms.

2.1. Theoretical aspects of information needs

Business intelligence acts as a shock-absorber among business executives and decision makers and excessive, constantly growing and changing flow of information; and, in this flow of information noise, BI has to identify and show important signals that can serve as the basis for useful insights.

All authors point out that information needs are formed by solving a specific problem, performing a specific task, when there is a gap between the already available information and knowledge and the information and knowledge required to achieve a specific goal. Line (1974), Höglund and Persson (1985) also emphasize the aspect of factual necessity of information needs, i.e. actually required information and the information that is thought to be required; in other words, objective or subjective information needs.

The distribution of information needs into general and specific ones enable the assumption that advanced informing consists of two layers, i.e. constant monitoring (Choo, 2001; Gill, 2010; Skyrius, 2013) and solving of complicated unplanned situations (Skyrius, 2013; Nicholas, 2000, Case, 2002; Gill, 2010), as shown in Figure 2 below.

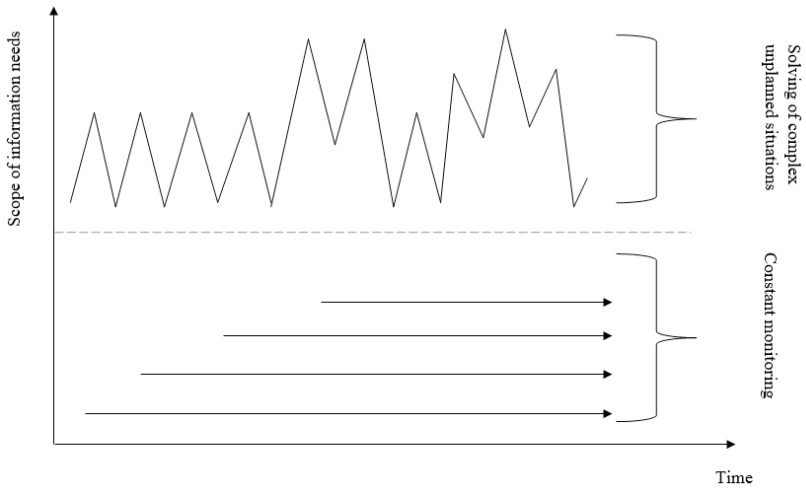


Figure 2. **Structure of advanced informing.** Compiled by the author.

In the constant monitoring layer, the process of satisfaction of BI information needs is continuous. The volume of BI information needs required for monitoring increases gradually as decision makers specify their questions until the balance between the volume and the resources to ensure such volume is reached. The volume of information needs to solve complicated unplanned situations fluctuates; there is an urgent need for additional and varying information. In such a case, an organisation has to ensure that the process of satisfaction of BI information needs is ‘fed’ rapidly and accurately. To achieve this, a business intelligence technology of an organisation has to grant access to the sought information and the information flow in an organisation, whereas the paths of sharing information have to be ‘free,’ the entire organisation has to be permeated with the spirit of the formulation and provision of insights necessary for decision-making. Taking this into consideration, a conclusion can be drawn that in order to ensure full-scale advanced informing in an organisation, it is necessary to develop not only a technology but also communication, motivation; in other words, to ensure the medium required to achieve advanced informing. Furthermore, a conclusion is made that both layers of advanced

informing – especially the upper one, i.e. solving of complicated unplanned situations – require not only a technology but also highly developed soft – human – factors.

2.2. Insights

The function of business intelligence is to perform informing processes of constantly increasing complexity that are intended for the creation of a high-value product. Based on the business intelligence definitions presented in the first part of this dissertation, a conclusion is drawn that decision makers have high expectations related to the insights formed with the help of business intelligence. Business intelligence encompasses the tools and processes which transform data into insights to assist in decision-making (Kandogan, et al., 2014). Most of the authors emphasize that an insight, in particular, is the most valuable raw material necessary for decision-making as well as the aim of business intelligence.

It can be argued that an insight is not aggregated information; it is a high-value product created through the process of business intelligence which fills the remaining gaps in the puzzle of the search for a decision. One of the main reasons why organisations implement business intelligence is to achieve better perception of their business processes, strategies and operations (Lönnqvist and Pirttimäki, 2006). Insight management in an organisation is a separate process (Davenport, 2015). Insights enable a clear perception of a situation, help to decide on further course of action, promote new or different ways of action, and encourage development and change. On the other hand, the opinion prevailing in scientific and practical literature stating that business intelligence systems provide executives with better-quality information which will improve their decisions, help solve problems and formulate valuable insights is wrong as it ignores the human factor. Executives can reject information irrespective of how good it is. Executives can be partial or can be incapable of using such information effectively (Marchand ir Peppard, 2013). On its own, the formulation of proper business insights does not guarantee their

integration into a decision and, even less so, into value for business. Often insights should be analysed in the context of other insights and reused in order to reveal a different perspective of a situation. To create the main business intelligence product, i.e. an insight, any valuable source of information and their processing tools will be employed, which, in turn, determines the complexity and variety of business intelligence activities (Skyrius and Nemitko, 2018). Based on the literature analysis in this chapter, a conclusion is drawn that a specific medium, the constituent elements of which are further analysed in the following sub-chapter, is required for the formulation and use of an insight.

2.3. Identification of key factors of satisfaction of business intelligence information needs

2.3.1. Communication. Sharing of information

Business intelligence and its technologies constitute a formal communication channel in an organisation, with the help of which complex BI information needs are satisfied. BI can be used to ensure both vertical and horizontal communication.

A cyclic model of satisfaction of information needs connects a user (an individual, group of individuals, organisation department, the entire organisation), the stages of satisfaction of information needs and simultaneously occurring accumulation of experience and new knowledge. A user with their existing knowledge and the context of experience is at the centre of the process of satisfaction of information needs. The environment of such a model consists of information sources and other user support tools (analytical procedures, models, decision support software) (Skyrius, 2013). In the model of effective satisfaction of information needs, communication is singled out as a framework of a specific medium ensuring the sharing of the information, knowledge and experience required for the formulation of an insight as well as the sharing of insights necessary for decision-making.

Communication processes depend on the type of culture prevailing in an organisation – vertical communication is characteristic of all organised activities, whereas horizontal communication manifests itself only in certain types of organisational culture. Herschel and Jones (2005) researched the factors limiting the sharing of information and insights and found that sharing of insights is not supported in such an organisational culture, where people are rewarded on the basis of what they know and the others don't know. Brijs (2013) came to a conclusion that a developed bureaucratic apparatus is incompatible with advanced business intelligence and the exchange of strategic insights. Mettler and Winter (2016) analysed the factors that promote the sharing of information in organisations by using social network platforms. The researchers tested the assumptions about relationships between information sharing in enterprise social platforms and such determinants as organizational information ownership norms (not significant), reciprocity and social cohesion (significant), the quality of shared information (significant), and privacy concerns (significant).

In scientific literature, the sharing of information, insights and experience is singled out as one of the critical factors of satisfaction of BI information needs. The sharing of insights among the members of an organisation has a positive impact on organisational activities (Davenport and Prusak, 1998). Nevertheless, promotion of sharing insights has remained problematic – professionals avoid sharing their expertise. Cultural values (Hofstede, 2001) and organisational culture (Alavi, *et al.*, 2005) also have a great impact on the sharing of knowledge. This is largely owing to the fact that information sharing is a wish and determination of a specific individual to provide information to other (Choo, 2013). The process of knowledge sharing in an organisation is largely determined by a rational decision-making process and the analysis of costs and benefits. Withholding of information is often regarded as a security strategy, whereas public sharing of information is used as tactics to earn a reputation, leave an impression on executives or get a promotion at work (Davenport and Prusak, 1998; Muller, *et al.*, 2005).

2.3.2. Organisational, information and analytical culture

A lot of authors of scientific literature highlight that organisational culture as well as constructive climate of communication in an organisation, which is central to the success of knowledge sharing, has an impact on the sharing of information, knowledge, insights and experience (Van den Hoof and Ridder, 2004). However, organisational culture could either encourage or hinder the intention of employees to share knowledge (Ardichvili, 2008). It is considered that innovative organisational culture which treats knowledge sharing as a problem-solving strategy promotes employee interaction (Hoegl, *et al.*, 2003). The organisational culture based on openness and decency also encourages knowledge sharing as it creates trust among organization members (Carl, *et al.*, 2004). In addition, the organisational culture that promotes the unity of organisation members and stresses cooperation and teamwork urges the sharing of insights as well (Bock, *et al.*, 2005).

Recently, the significance of the culture-related factors has increased noticeably; the terms in one way or another related to culture have also become widely spread (information culture, business intelligence culture, decision-making culture, data-driven culture, etc.) (Marchand, *et al.*, 2002; Viviers, *et al.*, 2005; Wells, 2008; Kiron and Shockley, 2011; Popovič *et al.*, 2012; Marchand and Peppard, 2013).

Several groups of factors that have an impact on the potential of advanced informing by implementing and using business intelligence systems are discussed below.

Human business intelligence factors. The problem area of business intelligence scientific research is increasingly shifting towards the realisation of the potential of the human factors and proper business intelligence culture (as part of organisational culture) as well as the overcoming of the obstacles hindering such realisation (Sangar and Iahad, 2013; Watson and Haley, 1997; Yeoh, *et al.*, 2008; Olszak, 2016). The main implementation problems of business intelligence projects indicated in numerous academic and practical sources (Gartner 2008) are fairly closely related with the human factors, with a great emphasis on the aspects of analytical culture.

Factors of analytical culture formation. Business intelligence culture is part of organisational and information culture but has specific properties that are not characteristic of the first two types of culture, for example, the existence of the community of analysts or sharing of analytical information. Marchand and Peppard (2013) emphasize that in order to successfully implement BI it is necessary to, ‘foster a collaborative culture in which transparency, trust, and sharing motivate managers and data scientists to contribute their best ideas and knowledge.’

To generalise the results of the research of the authors of publications in the field of problem-solving of BI information needs, business intelligence culture encompasses elements, participants and processes.

- 1) A horizontal community consisting of analysts and creators of business insights – representatives of the main functional areas.
- 2) Sharing of insights and information; synergy in a community which promotes generation of value, the formation of skills and competencies.
- 3) Sets of structured insights, experience and lessons learnt; insight support increases, community grows and the value of the entire system multiplies.
- 4) Balanced management of information technologies enabling the centralisation of elements; based on several general key standards and enabling the distribution of insights; supports self-service environment and is flexible and agile.

One of interesting recent tendencies is to attribute practically all informing activities to the sphere of business intelligence – from reports on operation management to support of strategic decisions. Some sources present a certain gradation of the scope of business intelligence projects (see Figure 3), which is based on better informing of organisation users, with a focus on new quality at the insight level, for example, the disclosure of new sources of value while observing the behaviour of organisation clients, especially in the cases when a client is granted the initiative to create their own model of servicing. Figure 3 illustrates how business intelligence penetration into the decision-making system of an organisation increases with every level of maturity.

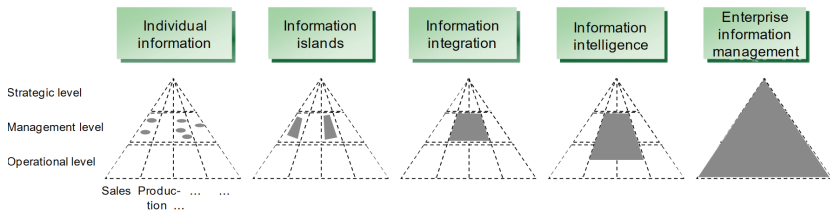


Figure 3. **Review of five BI maturity levels.** (Dinter, 2012)

To summarise the results of the analysis of scientific literature, the following main factors of satisfaction of BI information needs to achieve advanced informing are singled out:

- Information business needs are diverse and heterogeneous; business intelligence activities are addressed at the complex part of business information needs, where advanced informing is required, with the help of innovative technologies and methods.
- A specific product, i.e. insights, is expected from the activities of advanced informing. Insights are regarded as a specific type of information of concentrated relevance and high significance of meaning. As the experience of business intelligence and advanced informing shows, taken alone, high-level technological factors are insufficient to successfully exploit the potential of business intelligence and advanced informing.
- A lot of studies in the sphere of business intelligence emphasize the human factors and their significance, whereas a culture prevailing in an organisation serves as a prerequisite for their successful manifestation. Information culture is a part of organisational culture; in its turn, analytical culture comprises part of information culture; however, does not coincide with it as analytical culture possesses rather specific properties.
- The role of communication and information sharing in the processes of business intelligence is regarded as highly important as they expand the BI context, exploit more potential of human intelligence and, thus, improve the quality of insights.

3. RESEARCH ON FACTORS OF SATISFACTION OF BUSINESS INTELLIGENCE INFORMATION NEEDS

The first part of the third chapter of this dissertation describes the research idea, concept and the processes of the formation of the relationship model of the research factors as well as of the clarification of research tasks. The second part of this chapter describes the conducted analysis of the results of the research on factors of satisfaction of BI information needs and presents business intelligence information factors and their significance.

The research started from the analysis of the structure of the system of business intelligence indicators – constituting a composite information space – as a potentially important factor of satisfaction of BI information needs (exploratory research with 50 participating respondents) and then developed further into the analysis of technological, human and cultural factors (main research). The initial research focused on the investigation of satisfaction of information needs of one person; however, while studying the significance of these factors for advanced informing, it turned out that BI information needs of one person are related with and often formulated by the BI information needs of the surrounding environment, i.e. an organisation and the processes within, which, in its own turn, has an impact on the efficiency of satisfaction of BI information needs of an individual; and vice versa, the quality of satisfaction of BI information needs of an individual has an impact on the progress of satisfaction of BI information needs of the entire organisation. The results of the exploratory research are presented in the dissertation.

3.1. The concept of the main research

To summarise the results of the exploratory research, scientific and practical literature, a conclusion is drawn that high-quality data, information achieved with the help of contemporary technologies is only high-quality raw material which, on its own, does not guarantee the quality of a product, i.e. an insight. The results of the exploratory

research encouraged the shift of the emphasis in the main research from the focus on the structure of indicators, their presentation form, the scope and quality of information required for initial business intelligence to the analysis of the process of insight formation.

The research model was also improved by including the level of culture perceived as an important factor of created value, i.e. advanced informing. To ensure greater research purposefulness a decision was made not to research direct links between the human and technological factors in the context of this work.

The questions of the main research questionnaire were constructed on the basis of the research concept model of the relationship of factors of satisfaction of BI information needs. The attribution of the questionnaire questions to the groups of factors is illustrated in Figure 4.

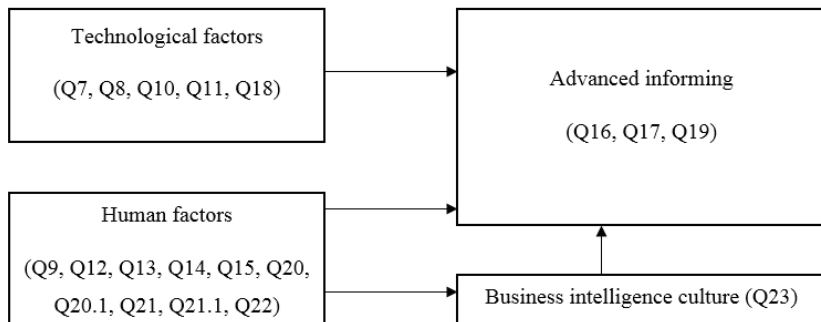


Figure 4. **Factor relationship model of the main research.** Compiled by the author

The questionnaire consists of the following several question groups:

- **Demographic indicators of the respondents:** profiles of companies, respondents and used business intelligence technologies.
- **Technological factors:** the use of business intelligence technologies (Q7), the use of business intelligence in an organisation (Q8), availability of the information required for business intelligence (Q10), a method of preparing reports required for business intelligence (Q11), perceived value for an

organisation created by the functions of a business intelligence system (Q18).

- **Human factors:** the person performing business intelligence in an organisation (Q9A), actual time needed for the presentation of the information required for business intelligence (Q9C), the need for business intelligence information from a related process or division (Q12), ways of obtaining the necessary business intelligence information from other functional divisions (Q13), a way of cooperation while performing business intelligence (Q14), ways of sharing insights (Q15), business intelligence indicators (Q20, Q20.1, Q21, Q21.1, Q22, Q22.1).
- **Business intelligence culture:** the perceived level of business intelligence culture (Q23).
- **Components of advanced informing:** the problems solved through the use of business intelligence (Q16), perceived business benefits obtained through the use of business intelligence (Q17B), the causes hindering the implementation and use of business intelligence (Q19).

The analysis of the results obtained during the research was conducted through the examination of the following scenarios of interaction between the variables:

- The impact of certain technological factors on advanced informing (X1->Y);
- The impact of certain human factors on advanced informing (X2->Y);
- The impact of the perceived level of business intelligence culture on advanced informing (X3->Y);
- During the analysis of the human factors, the role of the dependent variable was also attributed to X3. The significance of interaction between X2 and X3 was studied.

3.2. Analysis of the data obtained during research

The companies operating in Lithuania, the annual turnover of which is at least EUR 5m, participated in the research (44% of which report the annual turnover exceeding EUR 20m).

The distribution of the respondents as users of business intelligence results highlighted the tendency that 42% of the companies (selected answers: head of the company, IT manager, analyst) are orientated towards centralized business intelligence of all activity spheres. On the one hand, the indication of an IT manager as an important business intelligence representative indicates more the technological direction of the companies, i.e. to collect the data required for business intelligence from various sources and to manage such data in a centralized way. On the other hand, such a tendency poses a question for further research on the shift of IT managers from a technical to more managerial competence.

3.2.1. The analysis of technological factors and their impact on advanced informing

This sub-chapter presents the analysis of the results of the research on the factors of satisfaction of BI information needs that are attributed to the group of technological factors.

Q7. The use of business intelligence technologies

The research results confirmed once again that MS Excel is the most dominant tool to perform business intelligence. In their companies, 51% of the respondents use MS Excel or unique software solutions based on MS Excel developed specifically for their companies. Simultaneously, the research results indicate that the use of advanced BI systems is significant and 49% of the respondents use specialized BI systems.

When performing the statistical analysis of the factors Q7 ‘Use of technologies’ and Q16 ‘Problems solved through the use of business intelligence,’ a statistically significant difference between the values of these factors was not detected. Irrespective of what business intelligence tool or system was used by the respondents (11 business intelligence tools, systems were analysed), no significant difference between the companies using or not using a specific BI tool or system and, correspondingly, between the impact of employed technologies on the problems and their scope solved by business intelligence was

detected in none of the cases of business intelligence tools or systems. The same results were also achieved when analysing the impact of the use of technologies on the benefits obtained from business intelligence perceived by the respondents (Q17B). Taking this into consideration, it can be stated that the impact of the use of business intelligence tools, systems on advanced informing has not been detected.

Q8. The use of business intelligence in an organisation

The research results showed that up to 50 users were engaged in business intelligence in more than half of the surveyed companies. However, in nearly one third of the organisations, business intelligence is widely employed – over 250 users. Such results demonstrate the growth of the perception of business intelligence significance and, at the same time, point out that small installations are still prevailing.

The question **Q10 ‘Availability of the information required for business intelligence’** is intended to identify the ways how the information required to satisfy BI information needs reaches users and, thus, to reveal proper readiness to achieve advanced informing.

While analysing the interaction of the technological factor Q10 ‘Availability of the information required for business intelligence’ and the factor Q16 ‘Problems solved through the use of business intelligence,’ a statistically significant difference was detected ($t=2,389$; $p=0,018$) between the respondents who use a BI system and those who employ other means to access the information necessary for business intelligence. The research results confirmed once again the significance of the support provided by specialised business intelligence technologies to achieve advanced informing and distinguished the following technologies out of other alternative ways of performing BI in an organisation: reports generated by ERP systems, the tools based on MS Excel and even data cubes that are traditionally regarded to be part of BI technology.

The analysis of the interaction of the technological factor Q10 ‘Availability of the information required for business intelligence’ and the factor Q19 ‘The causes hindering the implementation and use of business intelligence,’ revealed a statistically significant

difference ($t=2,732$; $p=0,007$) between the respondents who access the information required for business intelligence by generating reports from ERP systems and those who do not do that. The scope of the obstacles to implement and develop business intelligence in the organisations that do not generate reports from ERP systems to perform business intelligence is much greater compared to that of the organisations which do generate reports from ERP systems for the performance of business intelligence.

While analysing the interaction of the technological factor Q10 'Availability of the information required for business intelligence' and the factor Q19 'The causes hindering the implementation and use of business intelligence,' a statistically significant difference was also detected ($t=3,325$; $p=0,001$) between the respondents who employ BI systems and those who use other means to access the information required for the analysis. In the organisations that use specialised business intelligence systems to conduct business intelligence the scope of the obstacles to implement and develop business intelligence is significantly smaller compared to that in the organisations where such systems are not exploited. The results confirmed that the impact of technological factors is unambiguously evident; however, as mentioned earlier and as other results of the research revealed, this is not the factor determining the success of BI implementation.

During the analysis of the values of the factor **Q11 'A method of preparing reports required for business intelligence'** and their interaction with the problems solved through the use of BI, i.e. the factor Q16, a statistically significant difference ($t=2,159$; $p=0,032$) was detected between the respondents in whose organisations the report data are obtained automatically and the respondents who prepare reports themselves in a non-automatic way or with the help of other individuals.

A conclusion is made that an automated way of preparing reports required for business intelligence presupposes the solving of more higher-level problems resolved with the help of business intelligence as well as creation of more tangible benefits for business perceived by the respondents.

The **Q18** research results showed that the **perceived value for an organisation created by the functions of a business intelligence system** (Q18) explained significantly the level of BI problem-solving (Q16) ($R^2=0,271$).

$$Y = 4,578 + 0,309(X) + e, \text{ where } Y = Q16, X = Q18.$$

The better the evaluation of the value for an organisation created by the functions of BI systems, the more of the problems of larger scale resolved with the help of business intelligence were solved by the respondents.

Moreover, the regression analysis revealed that the value for an organisation created by the functions of BI systems (Q18) perceived by the respondents explained significantly the perceived benefit for business created through the use of BI (Q17B) ($R^2=0,287$).

The better the evaluation of the value for an organisation created by the functions of BI systems, the better the evaluation of the benefit for business perceived by the respondents and created through the use of BI.

To summarise the results of the analysis of technological factors and their impact on advanced informing the conclusion is made that BI technologies automate a lot of routine business intelligence functions, improve the quality of data and information – the raw material for insights – and, thus, create an important and perceived value for an organisation, and presuppose higher-level analytical activities.

3.2.2. The analysis of human factors and their impact on advanced informing

Q9A. Who performs business intelligence on the basis of types of information in an organisation?

The analysis results revealed that there is a significant difference in the evaluation of the weighting of the factors hindering the implementation and development of business intelligence between the respondents in whose organizations the analysis is performed by the first and second level executives and the respondents in whose organizations, the analysis, irrespective of the type of information, is performed by the responsible person (Q9A).

The weighting of the factors hindering the implementation and development of business intelligence is smaller in the organisations where executives do the analysis of the information on the sales ($F=10,543$; $p=0,000$), supply ($F=3,781$; $p=0,024$), cash flows, debt management ($F=9,731$; $p=0,000$), finances ($F=8,083$; $p=0,000$) and derived indicators ($F=3,984$; $p=0,020$) themselves compared to the organisations where such information is analysed by responsible people (Bonferroni test).

Based on such research results, a conclusion is made that direct involvement of the first and second level executives in the process of business intelligence is highly important and significant to reduce the impact of the factors hindering the implementation and development of business intelligence.

Q12. The need for business intelligence information from a related process or division

When analysing the interaction of perceived business benefits through the use of business intelligence (Q17B) with the factor of the need for business intelligence information from a related process or division (Q12), a significant difference ($F=3,544$, $p=0,016$) was between the groups 'BI information from another process or division is constantly needed' and 'Not needed'; between 'BI information from another process or division is constantly needed' and 'Does not know, if it is needed'; and 'It is needed only when there is a delay in the process' and 'Does not know, if it is needed' (Bonferroni test).

With reference to the research results, the conclusion is made that in the organisations where BI information from other divisions or processes is constantly used and, thus, this presupposes a bigger picture and context, significantly more benefits for business are generated compared to the organisations which fail to perceive the need for the use of information from other divisions or processes to perform the business intelligence of its process or function.

A significant difference ($F=5,861$; $p=0,001$) was detected (Bonferroni test) between the factor 'The need for business intelligence information from a related process or division' (Q10) and the factor 'The causes hindering the implementation and use of

business intelligence' (Q19) in the answer groups of the respondents 'The information from a related process or division is constantly needed' and 'Does not know, if the information from a related process or division is needed'; 'The information from a related process or division is not needed' and 'Does not know, if the information from a related process or division is needed.'

The research results enable the drawing of the conclusion that the failure of executives to be aware of the need for information from another process or division to perform business intelligence causes bigger obstacles to implement and develop business intelligence in an organisation compared to the organisations where it is clearly defined what information is needed or not needed to perform business intelligence. The latter conclusion emphasises the importance of the definition of business intelligence strategy and information sharing in an organisation.

Q13. Ways of obtaining the necessary business intelligence information from other functional divisions

The research results showed that only 35% of the respondents 'service themselves' while performing business intelligence activities, which enables the drawing of the conclusion that 65% of the surveyed organizations do not have interdepartmental indicators, i.e. they do not see the full context required for the formation of an insight.

Moreover, the results revealed that the factor Q13 'Ways of obtaining the necessary business intelligence information from other functional divisions' has an impact on the level of the evaluation of problems solved through business intelligence (Q16). A significant difference ($t=2,591$; $p=0,010$) was detected between the respondents who have a direct access to the business intelligence information of other functional divisions and can use such information and those respondents who obtain the information required for business intelligence indirectly from other divisions or the process is very chaotic and not regulated.

Another detected significant difference also confirms the same conclusion. The respondents who address another division concerning the business intelligence information used in that division tend

to undervalue the success of problem-solving through business intelligence in an organisation compared to the respondents who obtain such information in other ways ($t=-2,037$; $p=0,043$).

The research results demonstrated that the factor Q13 'Ways of obtaining the necessary business intelligence information from other functional divisions' also influences the perceived business benefits received from business intelligence. When analysing this interaction, the same factor was highlighted, i.e. a significant difference ($t=3,540$; $p=0,000$) was detected between the respondents who have a direct access to the business intelligence information of other functional divisions and can use such information and those respondents who obtain the information required for business intelligence indirectly from other divisions.

The latter conclusion was further confirmed by other research results – the respondents, in whose organisations obtaining business intelligence information from related functions and divisions is not regulated and occurs in a chaotic manner, tend to give a lower score to the perceived benefits received by their organisation from business intelligence compare to the respondents who obtain such information themselves or in an expressly regulated way ($t=-3,250$; $p=0,001$).

Furthermore, the research results showed that the factor Q13 'Ways of obtaining the necessary business intelligence information from other functional divisions' has an impact on the scope of the obstacles hindering the implementation and development of business intelligence. A significant difference ($t=2,069$; $p=0,040$) was detected between the respondents who have a direct access to the business intelligence information of other functional divisions and can use such information and those respondents who do not obtain such information directly from other divisions.

With reference to the research results, a conclusion is made that a direct way of obtaining the required business intelligence information from other functional divisions causes fewer obstacles hindering the implementation and development of business intelligence compared to indirect ways of obtaining such information.

During the analysis, another significant difference ($t=2,049$; $p=0,042$) was detected between the respondents who clearly indicated

that there was no need to obtain information from another process or division to perform business intelligence and the respondents who did not define this clearly. The research results revealed that the uncertainty about the need for the information required for business intelligence causes greater obstacles hindering the implementation and development of business intelligence in an organisation.

The research results of the **Q14 factor ‘a way of cooperation while performing business intelligence’** showed that the success of problem-solving through business intelligence (Q16) of those respondents who cooperate actively in business intelligence and analyse data together is evaluated by a significantly higher score ($t=2,495$; $p=0,014$) compared to the respondents who do not analyse data together.

The scope of the factors hindering the implementation and development of business intelligence of the respondents who cooperate actively in business intelligence and analyse data together is much smaller ($t=4,044$; $p=0,000$) compared to the respondents who do not analyse data together.

The research results of the **Q15 factor ‘ways of sharing insights’** revealed a statistically significant difference ($F=3,106$, $p=0,017$) between ways of sharing insights (Q15) in the context of problem-solving through business intelligence (Q16). The Bonferroni Test method showed that a significant difference was detected between the following ways of insight sharing: ‘Exchanging insights constantly through direct communication’ and ‘Exchanging insights only during general meetings.’ Taking this into account, it can be stated that the organisations where insights are constantly exchanged the results of problem-solving through business intelligence are better compared to the organisations where insights are exchanged only during general meetings.

The LSD research method demonstrated that a significant difference ($F=2,914$; $p=0,023$) was also detected between the ways of sharing insights ‘Exchanging insights constantly through direct communication’ and ‘Exchanging insights only during general meetings’ as well as between ‘Exchanging insights constantly through

direct communication' and 'Do not exchange insights' ($F=2,914$; $p=0,023$). Taking this into consideration, it can be stated that the scope of the obstacles hindering the implementation and development of business intelligence is smaller in the organisations where insights are constantly exchanged compared to the organisations where insights are exchanged only in general meetings, whereas the greatest obstacles are formed in the organisations where insights are not exchanged at all.

Q20, Q20.1, Q21, Q21.1, Q22, Q22.1. Business intelligence indicators

A significant difference ($F=7,339$; $p=0,001$) was identified between the values of the Q20 factor 'Analysis of additional strategic indicators, apart from income and profit' and the causes hindering the implementation and use of business intelligence (Q19). The Bonferroni Test method revealed that there is a significant difference between the respondents whose organisations analyse additional strategic indicators (with the exception of income and profit) and the respondents who do not know whether additional strategic indicators are analysed in their organisations. Taking this into account, it can be claimed that a greater scope of the obstacles hindering the implementation and development of business intelligence is in the organisations where the respondents – first and second level executives – do not know whether any additional strategic indicators (with the exception of income and profit) are analysed in their organisations compared to the organisations who tend to analyse such indicators.

A significant difference ($F=4,166$; $p=0,017$) was identified between the values of the factor Q22 'Analysis of personal motivation indicators' and problem-solving through business intelligence (Q16). The Bonferroni Test method revealed that there is a significant difference between the respondents who do not know their personal motivation indicators and the respondents who analyse or do not analyse their personal motivation indicators. With reference to this, it can be stated that the results of problem-solving through business intelligence are poorer in the organisations where the respondents do not know their personal motivation indicators compared to the organisations where executives analyse or do not analyse their personal indicators. This

way, the importance of defining the application of business intelligence, i.e. BI strategy, is highlighted. No significant differences between the respondents who analyse or do not analyse their motivation indicators were identified.

The unawareness of executives of their personal motivation indicators causes poorer problem-solving through business intelligence in comparison to the organisations where it is clearly defined what personal motivation indicators of executives are or that there are no such indicators. A conclusion is drawn that business intelligence application in an organisation has to be clearly defined, thus, the importance of the existence of a business intelligence strategy and its compatibility with a corporate strategy is highlighted.

To summarise the results of the research on the human factors and their impact on advanced informing, a conclusion is drawn that when information processes are well-organised in an organisation and the human factors are supported (cooperation, sharing of information and insights, horizontal communication), problems are solved more efficiently and greater perceived value is created for business. The research results also demonstrated that the human factors are revealed better through technical factors as more attention can be given to problem-solving of a higher level or to the formation of deeper insights.

3.2.3. Advanced informing

The dissertation makes an assumption that the organisations which respond to BI information needs and which have succeeded in gaining considerable or significant benefit for business; have solved business problems through business intelligence; and have encountered fewer factors hindering business intelligence implementation, have made use considerably of advanced informing possibilities in creating value for business.

Q16. Problems solved through the use of business intelligence

The research results showed that in most cases the use of business intelligence enables the solving of problems of fragmented use of information and excessive effort.

The best results, i.e. 60%, were achieved by eliminating the problem of the lack of operative and relevant information. Moreover, the use of business intelligence enables 52% of the respondents to create a unified system and ensure single version of the truth.

The research results demonstrated that thirty companies out of one hundred do not have and do not see any problems in exploiting an excessive amount of people and technical resources to perform business intelligence and prepare reports; they do not think that it would be useful for employees to have the possibility to access the already prepared reports/analysis results. Such an attitude is often caused by the organisational culture – centralised or decentralised management, individual or collegial decision-making, etc.

The correlation analysis between **the expected BI benefit for business (Q17A) indicated by the respondents and the obtained benefit (Q17B)** revealed that the expectations of the respondents to promptly detect the problem areas and hidden links of business activities proved to be fulfilled most efficiently (correlation coefficient 0,776).

Q19. Causes hindering the implementation and use of business intelligence

The results of the analysis of the interaction of the causes hindering the implementation and use of business intelligence showed that there is a significant connection in organisations between the following pairs of causes (Correlation analysis):

- The lack of BI strategy and its incompatibility with the corporate strategy (0,735);
- Project manager of unsuitable qualification and the lack of internal project manager (0,681);
- The lack of internal project manager and the lack of ambassador (0,680);
- The lack of BI strategy and not well-organized, structured company processes (0,680).

On the basis of the results of the analysis of the correlations among the causes that hinder the BI implementation and development, a

conclusion is made that the main obstacles to implement BI are of complex nature and are related with the lack of leadership in disseminating BI in organisations as well as with insufficiency of BI implementation and use actions, procedure plans and structuredness.

During the regression analysis, interaction among the components of advanced informing was detected, i.e. the results of problem-solving through business intelligence (Q16) explain significantly the perceived benefit (Q17B) for business through the use of BI ($R^2 = 0,313$).

$$Y = 7,353 + 0,371(X) + e, \text{ where } Y = Q17B, X = Q16.$$

The research results indicated that the better the results of problem-solving through business intelligence, the higher the score of the benefits for business obtained through the use of BI and perceived by the respondents.

CARMA data mining method was employed to look for the associations among factors of satisfaction of BI information needs. The results of CARMA analyses showed that insufficient sharing of BI information in an organisation, i.e. everyone analyses the data of their own sphere – is manifested more when there are such factors as formal procedures for strategic information exchange – insights – prevailing in an organisation; decentralised way of obtaining the information required for BI (from different ERP systems); a more individualist approach in a company towards the preparation of important BI information, especially in local companies. In addition, the research showed that the respondents associate insufficient information exchange in an organisation with an average perceived level of BI culture. On the other hand, the results of CARMA analysis indicated that information sharing and the joint performance of BI activities are often caused by constant communication and the availability of operative information in immediate surroundings. CARMA analysis results confirmed the results of the statistical analysis concerning the causes hindering the BI implementation and use – if an organisation realises the importance of an internal project manager, it pays sufficient attention to their qualification; organisations that realise the importance of a BI ambassador usually have an internal BI project manager,

i.e. they treat the management of the process of BI implementation and dissemination in an organisation in a complex and professional manner. The research results also revealed that by joint data analysis, constant direct communication and insight exchange, monitoring of performance indicators of a division and personal motivation indicators, successful solving of the problems concerning the lack of operative information, reports, sharing and control of analysis insights and single version of the truth, organisations monitor and analyse a much larger field of corporate strategic indicators. This, in its turn, leads to the conclusion that organisational and human factors have a positive impact on the scope and depth of monitoring of an organisation and its environment; in other words, they bring an organisation closer to advanced informing.

3.2.4. Business intelligence culture

Q23. Perception of business intelligence culture

During the analysis of the research results, the level of business intelligence culture of an organisation played both the role of a dependent and independent variables. The research aimed to analyse the properties characteristic of a higher level of business intelligence culture. First and second level executives of the organisations taking part in the survey assessed the level of business intelligence culture in their companies by indicating the score (ranging from 1 (poor) to 5 (excellent)) to the question Q23 in the questionnaire.

Absolute majority of the respondents (89,9%) believe the level of business intelligence culture in their organisation is 3 (average), 4 (good) or 5 (excellent).

By indicating the score of the level of business intelligence culture of the organisation they work for, the respondents provided a free-form description of such an attributed score in writing. The descriptions of the levels of business intelligence culture provided by the respondents were grouped according to the main causes that, in the opinion of the respondents, determine the level of business intelligence culture. The results are given in Table 2.

Table 2. The causes that, in the opinion of the respondents, determine the level of culture. Compiled by the author on the basis of the research results.

Level of business intelligence culture	Causes determining the level of business intelligence culture
Average	Insufficient involvement of the people working in an organisation.
	Absence of business intelligence strategy.
	Absence of business intelligence ambassador.
High	Business intelligence is performed by all company specialists within the scope of their competence, responsibility and authorisation to make decisions.
	The existence of business intelligence strategy.
	Well-developed information sharing among company divisions.

It is important to note that all of the respondents marked that with an average or higher level of business intelligence culture, companies own business intelligence technologies that satisfy their needs fully. The latter fact leads to the conclusion that technological aspects are basic and important only in the stage from the initial to the average level of the development of business intelligence, whereas the success of business intelligence implementation and use as well as the achievement of advanced informing is shaped by the combination of human factors. This is clearly illustrated by the research results presented in Table 2 – in the opinion of the respondents, the gap between the average and high level of business intelligence is formed due to such human factors as a business intelligence strategy, business intelligence ambassador, the scope of dissemination of business intelligence in an organisation and the quality of the information flow required for business intelligence.

3.2.4.1. The impact of business intelligence culture on advanced informing

While analysing the impact of business intelligence culture on advanced informing, a significant difference (Bonferroni test) among the levels of business intelligence culture perceived by the respondents was detected in the context of the following components of advanced informing:

- The problems (Q16) that were solved through the use of business intelligence ($F=15,743$; $p=0,000$);
- The perceived business benefits (Q17B) obtained through the use of business intelligence ($F=13,164$; $p=0,000$).

The analysis of the problems solved through business intelligence (Q16) revealed a significant difference among all levels of business intelligence culture, with the exception of the levels of business intelligence culture assessed within a range of scores 2 and 3.

According to the research results, a significant difference dominates among the perceived levels 3-5 of business intelligence culture. This leads to the conclusion that a perceived high level of BI culture is associated with good experience of business intelligence problem-solving.

The analysis of the business benefits obtained through the use of business intelligence (Q17B) revealed a significant difference among 2 and 4, 2 and 5, 3 and 4, 3 and 5 levels of business intelligence culture.

The research results lead to the conclusion that the respondents who acknowledged tangible value from the application of business intelligence tend to evaluate the level of perceived culture as 'Good' or 'Excellent.'

While studying the benefits (Bonferroni test) expected by the respondents from the use of business intelligence (Q17A), a significant difference ($F=5,965$; $p=0,001$) was identified among 2 and 4, 2 and 5, 3 and 4 level of business intelligence culture.

The expectations concerning the generation of value for an organisation through the use of business intelligence differed significantly depending on the culture level. The research results enable the drawing of the conclusion that those respondents, who perceive the level of business intelligence as high, have considerable expectations concerning the growth of income. The organisation that have embraced business intelligence technologies start to believe that BI technologies can create a tangible and measurable value for business.

To generalise the results of the research on the impact of perceived level of business intelligence culture on advanced informing, a

conclusion is made that all successful cases, better problem-solving results, greater perceived benefits for business through the use of business intelligence are associated with a perceived high level of BI culture. Irrespective of the fact that culture, on its own, is a phenomenon difficult to assess, the research results indicated that corporate executives have a rather objective understanding of the existence of business intelligence culture and its strength (level). The research results have confirmed that the factor of business intelligence culture exists, whereas the fact that it is associated with high performance results only demonstrates the importance of the level of BI culture for the success of the implementation of business intelligence.

3.2.4.2. Interaction of business intelligence culture with technological and human factors

During the research it was also determined that with the increase of the perceived value created for an organisation through business intelligence functions (Q18), the perceived level of business intelligence culture also increases ($F=10,984$; $p=0,000$). A significant difference (Bonferroni test) was identified among 2 and 4, 2 and 5, 3 and 4, 3 and 5 levels of business intelligence culture.

Based on the research results, a significant difference dominates between the 3-4 perceived levels of business intelligence culture. This leads to the conclusion that during the transition from perceived level 3 to level 4 of business intelligence culture, the breakthrough in the uptake of BI technologies occurs, which signals that sufficient mastering level of technologies, i.e. the functions of BI systems, has been achieved and the obtained benefits have been acknowledged.

Other research results further confirm the subjective description of the level of business intelligence culture provided by the respondents – the assessment of the importance of the factor of information sharing in an organisation for the level of business intelligence culture (Q12 -> Q23).

The answers to the Q12 question ‘In what cases do you require other kind of information (information from other related process, division) to perform business intelligence?’ were coded in the following manner:

- NU – information is needed constantly;

- IR – information is needed only when a certain process is delayed in my division and the cause has to be detected;
- IN – information from other divisions is not needed;
- NE – I don't know.

The results of the research data analysis revealed that where there was 3 and 4 level of business intelligence culture, the dominating part of the respondents answered the Q12 question indicating that the information from other divisions and business processes required to perform business intelligence was constantly needed (Figure 5. Interaction between Q12 and Q23 cases). This, in its turn, reflects the idea that one of the natural properties of business intelligence is well-developed information sharing at the level of the entire organisation.

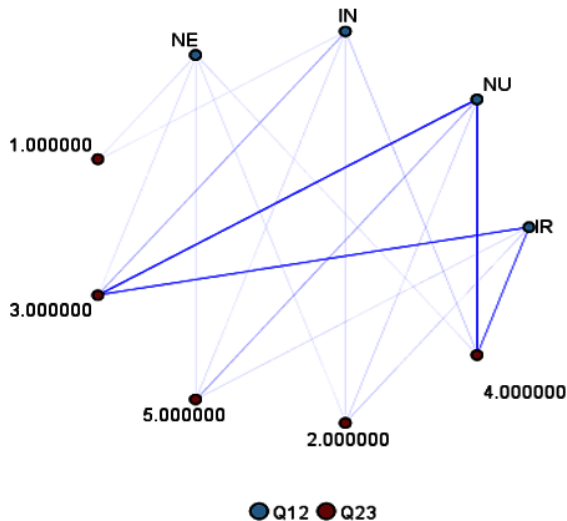


Figure 5. **Interaction between Q12 and Q23 cases.**
(Skyrius, Nemitko, & Taločka, 2018)

To generalise the results of the research, a connection between the level of business intelligence culture perceived by the respondents and the intensity of information sharing among business processes was observed. In its turn, the sharing of the information required for business intelligence improves the quality of insights, helps to identify problems and explore the context more accurately, shapes business

intelligence community and supports its development in dynamically changing business conditions.

Moreover, the connection between BI properties and the perceived level of BI culture (bigger than the average, i.e. 3 and higher) was investigated during the research. Attention should be drawn to the fact that in the context of this research a higher BI culture level is not necessarily related with a higher BI maturity stage. Such an opinion was shaped partly due to the idea that, as has already been mentioned in the first chapter of this dissertation, most of the proposed BI maturity models have limitations, i.e. clear past and optimistically vague future. Furthermore, it has not been detected whether BI culture is related with the phases in time. BI culture is more closely related to a certain type of organisational culture that can be mature in its own way (Skyrius and Nemitko, 2018).

To conduct the research the answers to the questions Q11, Q12, Q13, Q14, Q15, which represent horizontal communication among the participants involved in business intelligence, were defined as independent variables. Perceived level of BI culture (Q23) was selected as a dependent variable. As the research did not include exhaustive explanations as to the evaluation of the level of BI culture, an assumption can be made that relative reluctance of the representatives to indicate the maximum level of BI culture can be explained by the prevailing opinion about constant BI implementation drawbacks. With reference to the aforementioned assumption, the most realistic favourable evaluation of BI activities is 4 – ‘Good.’

The five key reasons why it was more difficult to implement business intelligence in an organisation are related with the lack of leadership, which is attributed to BI culture: the lack of a BI ambassador (24 cases), BI benefits hardly perceived by employees (16 cases), the lack of a business intelligence strategy (15 cases), the lack of an internal project manager (15 cases), the dilemma of an owner (14 cases).

The research results revealed that when the perceived level of BI culture is higher, information sharing among the participants of BI activities is a regular and valuable process.

The following two additional stages of analysis were conducted to check the obtained results:

- Regression analysis among the values of Q23 and the values of Q12, Q15;
- Neural network analysis to evaluate the forecasting strength of perceived BI culture level (Q23) through the answers to the questions Q11, Q12, Q13 and Q15;
- Web diagram analysis to identify the connections between the answers to the question Q23 and the answers to the questions Q13 and Q15.

In order to carry out the regression analysis, the answers to the questions Q11 and Q13 were rejected owing to their specific coding, whereas the impact of Q15 was rejected as insignificant. The following regression equation was obtained through the regression analysis between Q12 and Q23:

$$Q23 = 2,770 + Q12 (0,214) + e$$

During the neural network analysis, the questions Q11, Q12, Q13 and Q15 were defined as the variables of forecasting of perceived level of BI culture and the neural network with one hidden layer containing one knot was generated. The results of the neural network analysis are presented in Table 3.

Table 3. Results of neural network analysis. Forecasting of perceived BI culture level. (Skyrius and Nemitko, 2018)

Sample	Observed	Predicted					Percent correct
		1	2	3	4	5	
Training	1	0	0	1	0	0	0,0%
	2	0	0	12	3	0	0,0%
	3	0	0	38	22	0	63,3%
	4	0	0	20	36	0	64,3%
	5	0	0	5	8	0	0,0%
	Overall percent	0,0%	0,0%	52,4%	47,6%	0,0%	51,0%
Testing	1	0	0	2	0	0	0,0%
	2	0	0	3	0	0	0,0%
	3	0	0	15	10	0	60,0%
	4	0	0	12	11	0	47,8%
	5	0	0	4	4	0	0,0%
	Overall percent	0,0%	0,0%	59,0%	41,0%	0,0%	42,6%

Moreover, the research results showed that during both stages, i.e. training and testing, the strongest forecasting level is characteristic of Q23 cases 3 and 4. This could be explained by the prevalence of these values among all of the answers. General forecasting strength is smaller – 51,0% for the training stage and 42,6% for the testing stage. This drawback can be explained by the lower frequency of other answers of Q23 cases.

The connections between Q13 and Q23 were studied with the help of the web diagram analysis method. To answer the question Q13 ‘In what ways do you obtain the information required for business intelligence from other functional divisions to make a business decision?’ the respondents could select several answer variants.

Figure 6 illustrates the web diagram of the strongest connections between the answers to Q23 and Q13.

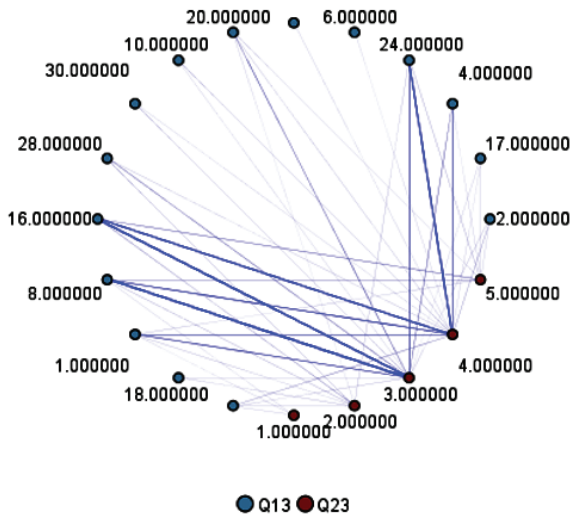


Figure 6. **Connections between answers to questions Q13 and Q23** (Skyrius and Nemitko, 2018)

The obtained research results lead to the conclusion that the cases when the information required for business intelligence is obtained from other divisions upon request or by way of self-service are prevailing. This confirms an important user pull role in BI activities.

The data collected during the research showed that the most frequently occurring answers to the question Q15 ‘How do exchange business insights obtained through business intelligence inside your organisation?’ included the answers KN – ‘We constantly exchange insights through direct communication or the initiated discussions’ and KB – ‘We exchange insights only during general meetings.’ In both cases, the answers revealed active and constant presentation of general insights by indicating that the information flow shafts among the departments and functions of an organisation were opened or did not exist at all. This only confirms the conclusion that with higher perceived level of BI culture, active information sharing is more widespread and takes place both formally and informally.

The analysis of the empirical data indicated that the dominating part of the respondents of the surveyed organisations perceive BI culture and evaluate its level from average to excellent. Such organisations know their BI information needs very well and support rather actively the sharing of information by way of horizontal communication. This leads to the conclusion that in the organisations, the representatives of which are most satisfied with their business intelligence culture, there is the environment where information sharing is a natural way to perform business intelligence and also one of the key properties of business intelligence environment.

The analysis of information sharing leads to the conclusion that the cases when the information from related processes or departments is made available upon request are dominating which emphasises a strong role of user pull.

With high perceived level of BI culture, active information sharing through both formal and informal channels among the participants of business intelligence activities is quite a common phenomenon. The sharing of information in such organisations is a regular and valuable process. Business intelligence culture – including the human factors – can be regarded as the integration axis of all of the information managed by an organisation and can maintain the standards of reliable evaluation of business environment.

CONCLUSIONS AND SUGGESTIONS

1. The analysis of published scientific studies has revealed that there is an obvious need for the research on the impact of the human factors on the value created by business intelligence.
2. The results of the analysis of published scientific research confirm the need to study BI culture as an important factor affecting the satisfaction of BI information needs.
3. To summarise the results of the analysis of scientific literature, the dissertation employs the concepts of advanced informing and business intelligence culture which, respectively, define:
 - The upper range of complexity of business information needs;
 - The totality of organisational and individual human factors.
4. The results of the analysis of scientific literature have shown that the main and most valuable product of business intelligence and advanced informing are insights, which, in their turn, enable clearer perception of a situation, help to decide on further course of action, promote new or different ways of action, and encourage development and change.
5. The research has revealed that business intelligence information needs are closely connected with information and communication technologies; however, they are not shaped by such technologies. Organisational, management, social and psychological aspects, i.e. the human factors, have a greater impact on formation, satisfaction and development of such needs.
6. The research results have shown that BI technologies automate a lot of routine business intelligence functions, improve the quality of data and information – the raw material for insights – and, thus, create an important and perceived value for an organisation, and presuppose higher-level analytical activities.
7. Sharing of information, insights, and experience is singled out as one of the critical factors of satisfaction of business intelligence information needs which has a positive impact on

organisational activities. Nevertheless, the research has revealed that the promotion of sharing of insights is still problematic, i.e. professionals are reluctant to share their expertise. Personal cultural values as well as organisation and information cultures influence greatly the sharing of insights.

8. The research results have revealed that when information processes are well-organised in an organisation and the human factors are supported (cooperation, sharing of information and insights, horizontal communication), problems are solved more efficiently and greater perceived value is created for business. The results have also demonstrated that the human factors are revealed better through technical factors as more attention can be given to problem-solving of a higher level or to the formation of deeper insights.
9. The research results have revealed that all successful cases, better problem-solving results, greater perceived benefit for business through the use of business intelligence are associated with perceived high level of BI culture. Irrespective of the fact that culture, on its own, is difficult to assess, organisation managers have a rather objective understanding of the existence of business intelligence culture and its strength (level). The research results have confirmed that the factor of business intelligence culture exists, whereas the fact that it is associated with high performance results only demonstrates the importance of the level of BI culture for the success of the implementation of business intelligence.
10. Due to the complexity of the researched subject area the dissertation has only focused on certain parts of BI problem aspects. Further research should be directed at more comprehensive studies of the human factors and analytical culture in order to better understand in-depth dependency between technological and human factors. The assumptions for further research could be the following: information sharing should improve the quality of information and, respectively, the quality of insights as the study of different

analysis results and the investigation of the causes of their differences (comparable or related things) provide the possibility to notice discrepancies.

11. On the basis of the research results, the main recommendation for the organisations introducing BI is to treat business intelligence information system not only as a technology but, in particular, as the totality of information management, the implementation and use of which requires clearly defined procedures as well as trained personnel and includes formal and informal promoting parts. On its own, although a highly advanced technology, a BI system does not guarantee successful implementation and use of BI in an organisation. Successful implementation and use of BI systems can only be achieved through, in particular, a properly prepared environment, i.e. well-arranged information processes, well-organised and managed human factors, and nurtured BI culture.

REZIUMĖ

Temos aktualumas

Informacija verslo arba kiekvienoje racionalioje veikloje visada turėjo ypač svarbų ir dažnai kritinį vaidmenį. Informacinių technologijų paplitimas tapo informacinės veiklos paskata ir išplėtojo jos galimybes. Šiuo metu esamų rinkoje informacijos ir ryšio technologijų tinkamas panaudojimas sudaro prielaidų sustiprinti verslo atsparumą ir gyvybingumą permainingame veiklos kontekste.

Verslo valdymo sistemų (angl. *ERP*) ir verslo analitikos (angl. *Business Intelligence*) sistemų gamintojo – pasaulio lyderio SAP – teigimu, visuomenė įžengia į skaitmeninio renesanso – intensyvios intelektinės veiklos ir kūrybiškumo – erą (angl. *Digital Renaissance*). Skaitmenizavimas vyksta taip sparčiai, kad 72 proc. finansų vadovų (angl. *CFO*) tiki, kad artimiausi treji metai bus labiau kritiniai jų verslo veiklai negu pastarieji 50 metų. Tačiau kol kas tik 5 proc. respondentų suvokia, kad verslo skaitmenizavimas jau tapo konkurencinio pranašumo pagrindu (Howells, 2017).

Šiuolaikinėje verslo aplinkoje esminis konkurencinį pranašumą lemiantis veiksnys, o dažnai ir tolesnio vystymosi pagrindinė sąlyga yra itin greita, kartu gerai apgalvota ir pagrįsta reakcija į aplinką. Esant tokioms aplinkybėms verslo visuomenė susidūrė su naujais iššūkiais – būti ne tik informuotiems, bet ir lanksčiai, giliai informuotiems, ir būtinybe preventyviai pastebėti vertingus aplinkos kitimo požymius, kurie turi įtakos verslo sprendimų rezultatams. Remiantis dinaminių gebėjimų koncepcija (Teece, 2014), realus patvaraus konkurencinio pranašumo šaltinis greitai besikeičiančioje išorinėje aplinkoje yra organizacijos gebėjimas anksčiau nei konkurentai įžvelgti išorinės aplinkos pokyčius ir operatyviai pakeisti savo išteklių konfigūraciją. Toks intelektualus informavimas, kurio produktas yra vertingos verslui įžvalgos, galėtų būti pavadintas pažangiu informavimu (angl. *Advanced informing*) (Skyrius, *et al.*, 2018) – informacinė veikla, kuri palaiko ir vysto organizacijos gebėjimą anksčiau nei konkurentai įžvelgti aplinkos pokyčius šiuolaikinėje konkurencinėje aplinkoje

(Teece, 2014). Taigi pažangus informavimas tapo esmine veiklos gyvybingumo užtikrinimo sąlyga šiuolaikinėje greitai besikeičiančioje verslo aplinkoje. Tačiau nors rinkoje gausu pajėgių šią sąlygą įvykdyti informacinių technologijų, pažangus informavimas pasirodė nelengva užduotis ir suformavo prielaidų mokslinei problemai iškelti ir tirti.

Disertaciniame darbe daroma prielaida, kad organizacijos, kurioms tenkinant verslo analitikos informacinius poreikius:

- pavyko gauti pastebimą ar reikšmingą naudą verslui,
- išspręsti verslo veiklos problemas naudojant verslo analitiką arba
- kuriose yra mažiau verslo analitikos diegimą ir naudojimą trikdančių veiksnių,

reikšmingai pasinaudojo pažangaus informavimo galimybėmis kurdamos vertę verslui.

Mokslinė problema ir jos ištyrimo lygis

Per pastaruosius du dešimtmečius verslo analitikos sritis patyrė dinamišką augimą – nuo statinių ataskaitų (angl. *Reports*) iš verslo valdymo sistemų iki leidžiančių atlikti automatines didelio patikimumo prognozes iš neriboto kiekio ir didelės apimties duomenų šaltinių verslo analitikos sistemų. Neatsižvelgiant į tai, į tinkamo informavimo klausimus, pavyzdžiui, „Ar tikrai organizacija gauna būtent tą informaciją, kuri jai yra reikalinga patenkinti verslo informacinius poreikius?“, „Ar gauta informacija sudaro prielaidas padaryti tinkamas išvalgas, atitinkančias organizacijos strategiją ir rinkos aktualią situaciją?“, „Ar esanti verslo analitikos kultūra skatina tinkamų išvalgų formavimą ir jų kokybišką transformavimą į verslo vertę kuriančius sprendimus?“ iki šiol neatsakytą.

Dabar informacinių technologijų rinkoje yra gausu įvairių verslo analitikos (toliau tekste – VA) sistemų ir technologijų, galinčių patenkinti skirtingo dydžio, veiklos srities ir finansinių galimybių verslo organizacijų analitikos informacinius poreikius. Tačiau remiantis statistika didžioji dauguma VA projektų dėl įvairių technologinių ir žmogiškųjų veiksnių nesukūrė verslui numatomos naudos ir,

galima sakyti, buvo nesėkmingi. VA sistemų ir technologijų diegimo ir naudojimo organizacijos veikloje nesėkmė nėra verslo analitikos informacinių poreikių netinkamo tenkinimo rezultatas. Tai yra tik indikatorius, sudarantis prielaidų gvildinti verslo analitikos informacinių poreikių tenkinimo veiksnius kaip mokslinę problemą. VA technologijos turėtų būti verslo sėkmės skatinamąjį jėgą, bet tyrimai rodo, kad organizacijos nepasiekia užsibrėžtų tikslų ir nesukuria pridėtinės vertės 70–80 proc. atvejų (Howson, 2008; Davenport, Harris, Morison, 2010; Wixom, Watson, 2010); VA diegimo ir naudojimo problemoms ir nesėkmėms mokslinėje literatūroje yra skiriama daug dėmesio (Arnott, 2008; Ahmed, 2014; Gurjar ir Rathore, 2013; Olszak, 2016; Ortiz, 2014).

Verslo informacijos sritis yra tiriama labai įvairiais pjūviais, bet dauguma jų iki šiol turi technologinį atspalvį. Kita vertus, verslo informacijos analitikos erdvė iš informacijos vartotojų perspektyvos yra itin mažai ištirta.

Verslo analitikos mokslinių tyrimų problematika vis labiau keičiasi: siekiama labiau atskleisti ne technologinių veiksmų, o minkštųjų, kitaip žmogiškųjų (apimant organizacinius, vadybinius veiksmus, bet jais neapsiribojant) veiksmų potencialo realizavimo galimybes ir įveikti trukdančias šias galimybes įgyvendinti kliūtis (Olszak, 2016; Yeoh ir Koronios, 2010). Tačiau svarbūs siekiant pažangaus informavimo žmogiškieji veiksniai iki šiol yra nepakankamai ištirti.

Tinkama organizacinė kultūra vis dažniau identifikuojama kaip vienas iš pagrindinių ir vis labiau ryškėjančių veiksmų, kuris daro įtaką verslo analitikos sistemų diegimo sėkmei ir verslo analitikos informaciniams poreikiams tenkinti (Sangar ir Iahad, 2013; Yeoh, *et al.*, 2008; Watson ir Haley, 1997), bet VA kultūra, kaip verslo analitikos informacinių poreikių tenkinimo veiksnys, beveik nėra tirta.

Mokslinį susidomėjimą verslo analitikos informacinių poreikių tenkinimo veiksniais skatina ir praktinis poreikis. Tačiau kiekviena praktinė patirtis realiame gyvenime apsiriboja konkrečių verslo subjektų veiklos specifikos išmanymu ir konkrečių projektų patirtimi. O mokslinis problematikos gvildenimas sudaro prielaidų globaliai

ir giliai pažvelgti į problemos atsiradimo priežastis, rasti būdingus tiriamai aplinkai dėsningumus ir nustatyti paslėptas aplinkybes.

Atsižvelgiant į išvardytas mokslinės problemos suformulavimo prielaidas, šiame disertaciniame darbe nagrinėjama mokslinė problema yra poreikis priartėti prie atsakymo į organizacijoms, kurios veikia šiuolaikinėje itin dinamiškoje aplinkoje, gyvybiškai svarbų klausimą „Kokie verslo analitikos informacinių poreikių tenkinimo veiksniai sudaro prielaidų gerinti įžvalgų ir sprendimų kokybę pažangaus informavimo dėka?“

Tyrimo objektas – verslo analitikos informacinių poreikių tenkinimo veiksmų sistema.

Tyrimo tikslas – identifikuoti verslo analitikos informacinių poreikių tenkinimo veiksmus, kurie skatina pažangų informavimą.

Tyrimo tikslui pasiekti keliami tokie uždaviniai:

- išnagrinėti verslo analitikos informacinių poreikių iširtumą mokslinėje literatūroje;
- apibrėžti ir pagrįsti aktualiausias verslo analitikos problematikos sritis;
- nustatyti verslo analitikos informacinių poreikių tenkinimo veiksmus dinamiškos verslo aplinkos kontekste ir jų sąsajas;
- nustatyti verslo analitikos informacinių poreikių tenkinimo veiksmus, kurie pažangaus informavimo dėka skatintų verslo vertės kūrimą.

Disertacijos tyrimo metodai

Disertacijai parengti naudoti tyrimo metodai yra parinkti remiantis mokslinių tyrimų metodologija, nuodugniai išanalizavus socialinių mokslų tyrimų vykdymo metodų aibę ir jų pritaikomumo aspektus.

Verslo analitikos informacinių poreikių tenkinimo veiksmų tyrimas priskirtinas informacinių sistemų sričiai, o tiriama mokslinė problema yra glaudžiai susijusi su žmogiškaisiais veiksniais. Atsižvelgiant į tai, ir žvalgomajam ir pagrindiniam tyrimui atlikti buvo pasirinkti giluminio interviu ir apklausos metodai, kaip tiesiogiai atspindintys

asmens nuomonę ir pasižymintys individualiu faktų išdėstymu. Abu tyrimai yra priskirtini prie mišrių tyrimų, nes naudojami ir kiekybiniai, ir kokybiniai tyrimo metodai.

Atsižvelgiant į mokslinėje literatūroje pateiktas tyrimo metodų naudojimo rekomendacijas ir žvalgomojo tyrimo metu sukauptą patirtį, pagrindinis tyrimas buvo atliktas tokia tyrimo metodų naudojimo seka: mokslinės literatūros šaltinių analizė, informacijos sisteminimas ir apibendrinimas, ekspertų apklausa (buvo apklausti 5 ekspertai), apklausa anketos ir interviu būdais. Apklausa buvo vykdoma bendradarbiaujant su IT SUMMIT konferencijų rengėju (<https://itsummit.lt/>). Apklausa atliko profesionalus apklausų vykdymo centras.

Pagrindinio tyrimo anketai sudaryti ir testuoti buvo skiriama ypač daug dėmesio dėl respondentų specifikos: didelis respondentų užimtumas, nenoras atskleisti verslo sėkmei kritinės informacijos, nebuvo galimybės pasiekti respondentų masinėmis priemonėmis, poreikis derinti anketos turinį su už viešuosius ryšius ir komunikaciją įmonėje atsakingais asmenimis.

Šio tyrimo populiacija yra Lietuvoje veikiančių verslo įmonių, kurių analitikos branda aukštesnė nei vidutinė, pirmo ir antro lygio vadovai, nes jie dažniausiai ir yra pagrindiniai verslo analitikos informacinių poreikių generavimo šaltiniai, verslo analitikos informacinių poreikių tenkinimo organizacijoje kryptį reguliuojantys ir šių poreikių tenkinimo rezultatus galintys įvertinti asmenys.

Vienareikšmiškai nustatyti įmonių verslo analitikos brandos lygį pasinaudojus tik viešaisiais informacijos šaltiniais ir atitinkamai tiksliai apibrėžti populiacijos dydį nėra galimybės, todėl buvo naudotas netikimybinis imties parinkimo būdas. Imtis buvo formuojama kryptingai, darant prielaidą, kad atrinkti elementai atitinka tikslinę auditoriją. Pradinė imtis buvo suformuota iš autorės profesinių kontaktų ir IT SUMMIT konferencijų dalyvių, kurie sutiko dalyvauti IT SUMMIT atliekamuose tyrimuose. Toliau imtis buvo didinama „sniego gniūžtės“ principu – respondentai įvardydavo dar kelis potencialius respondentes, galinčius suteikti reikiamos informacijos. Planuota apklausti iki 200 respondentų, apklausti 207 respondentai.

Tiriamosios srities santykinis naujumas ir siekis aptikti reikšmingų savybių ir ryšių lėmė mišraus tyrimo pasirinkimą.

Duomenys apdoroti „SPSS Statistics V26“ ir „IBM SPSS Modeler 18.2“ kompiuterių programų. Tyrimo metu gauti duomenys buvo analizuojami naudojant statistinės analizės, neuroninių tinklų, Web diagramų, „Carma“ analizės metodus. Keli tyrimo metodai pasirinkti siekiant neutralizuoti tam tikrų tyrimo metodų šališkumą ir paklaidas.

Tyrimo metu buvo susidurta su šiais sunkumais ir apribojimais:

- sudėtinga pasiekti tyrimo pobūdį ir tikslinės grupės reikalavimus atitinkančius respondentus;
- tyrimo metu renkama konfidenciali ir verslo sėkmei kritinė informacija, kuria respondentai nenoriai dalijasi;
- iš anksto nebuvo tiksliai žinoma, koks yra įmonės respondentės verslo analitikos brandos lygis. Buvo rizika surinkti nevertingų tyrimui duomenų, kuriuos vėliau reikėtų pašalinti.

Disertacinio darbo struktūra ir apimtis

Šio darbo struktūra sudaryta atsižvelgiant į tyrimo tikslą ir numatytus atlikti uždavinius. Disertaciją sudaro įvadas, trys dėstomosios dalys, išvados ir pasiūlymai, literatūros sąrašas ir priedai. Disertacijos apimtis – 184 puslapiai, joje pateiktos 68 lentelės, 20 paveikslų ir 2 priedai. Buvo panaudoti 179 literatūros šaltiniai.

Pirmame darbo skyriuje nuodugnai gvildenami mokslinėje ir praktinėje literatūroje vyraujantys požiūriai į verslo analitikos sampratą ir identifikuojamas verslo analitikos tikslas – pažangus informavimas. Šiame skyriuje taip pat nagrinėjamos verslo analitikos savybės, kurios turi įtakos verslo analitikos informacinių poreikių tenkinimo rezultatui: daugiadimensiškumas, branda ir judrumas, pateikiami skirtingų autorių požiūriai į verslo analitikos vaidmenį, VA sistemas, pasitelkiamas technologijas VA atlikti ir jų diegimo ir naudojimo ypatumus, aprašomas verslo analitikos taikymas vadybos veikloje, pateikiamas tyrimo objekto pasirinkimo ir tiriamos mokslinės problemos svarbos pagrindimas. Apžvelgus ankstesnius tyrimus, mokslinėje literatūroje pateikiamą verslo analitikos informacinių poreikių tenkinimo veiksmų klasifikaciją skiriamos dvi pagrindinės verslo analitikos informacinių poreikių tenkinimo veiksmų grupės – technologiniai ir žmogiškieji veiksniai.

Antroje disertacinio darbo dalyje analizuojama verslo analitikos informacinių poreikių samprata, verslo analitikos informacinių poreikių tenkinimo procesas ir jo rezultatas – įžvalga. Antroje darbo dalyje taip pat išskiriami pagrindiniai verslo analitikos informacinių poreikių tenkinimo veiksniai: komunikacija, dalijimasis informacija, kultūra, kurie, remiantis mokslinės literatūros analizės rezultatais, sudaro prielaidų skatinti pažangų informavimą.

Trečioje disertacinio darbo dalyje aprašoma tyrimo idėja, koncepcija, tyrimo konstrukto formavimosi ir tyrimo uždavinių išgryninimo procesai, atlikta verslo analitikos informacinių poreikių tenkinimo veiksnių tyrimo rezultatų analizė ir pateikiamas verslo analitikos informacinių veiksnių ir jų svarbos vertinimas.

Išvadų dalyje pateikiamos apibendrintos ir susistemintos atliktos mokslinės literatūros analizės ir dviejų tyrimų (žvalgomojo ir pagrindinio) rezultatų analizės išvados.

Praktinis disertacijos reikšmingumas

Šioje disertacijoje gvildinama problematika, kaip aprašyta prieš tai, yra nulemta faktinių praktinių aplinkybių, viena, panaudoti pažangių technologijų potencialą, kita – būtinybės siekti pažangaus informavimo, kuris leistų organizacijoms sėkmingai vystytis ypač dinamiškoje šiuolaikinėje verslo aplinkoje. Verslo analitikos informacinių poreikių tenkinimo veiksnių temos praktinį reikšmingumą taip pat patvirtina faktas, kad šio darbo pagrindinis tyrimas buvo inicijuotas bendradarbiaujant su IT SUMMIT organizacija, vienijančia Lietuvos verslo organizacijas, joms atstovaujančius vadovus ir verslo analitikus. Šio tyrimo rezultatai buvo aprobuoti svarbiausioje Lietuvos verslo analitikos praktinėje-mokslinėje konferencijoje „BUSINESS INTELLIGENCE DAY“ ir buvo šios konferencijos pagrindinė tema.

Toks praktinės bendruomenės susidomėjimas verslo analitikos informacinių poreikių tenkinimo problematika ir mokslininkų pasitelkimas joms spręsti yra nulemtas poreikio išskleisti verslo analitikos kuriamos vertės organizacijai galimybes. Verslo analitikos diegimas ir naudojimas net jei ir neduotų organizacijai ypatingos vertės įžval-

gų atlieka svarbų visos įmonės informacinės veiklos sutvarkymo katalizatoriaus vaidmenį. Verslo analitika skatina geresnį organizacijos informacinės veiklos kryptingumą ir remia informacinių poreikių tenkinimą, idealiu atveju leidžia pasiekti pažangų informavimą, o tai suteiktų organizacijai tikslesnį ir gilesnį aplinkos matymą, įvertinimą ir skatintų geresnius veiklos rezultatus.

Ginamieji disertacijos teiginiai

Tyrimo metu buvo numatyta ištirti šias pagrindines prielaidas:

- Verslo analitikos informacinių poreikių tenkinimo technologiniai veiksniai sukuria prielaidų aukštesnio lygio analitinei veiklai, bet patys savaime neužtikrina verslo analitikos informacinių poreikių tenkinimo tikslo – pažangaus informavimo.
- Verslo analitikos informaciniams poreikiams tenkinti reikšmingą įtaką turi organizaciniai, vadybiniai, socialiniai ir psichologiniai aspektai – žmogiškieji veiksniai.
- Dalijimasis informacija, išvalgomis, patirtimi yra vienas iš kritinių verslo analitikos informacinių poreikių tenkinimo veiksnių ir suformuoja prielaidų pasiekti pažangų informavimą.
- Sutvarkyti informaciniai procesai ir palaikomi organizacijoje žmogiškieji veiksniai (bendradarbiavimas, dalijimasis informacija ir išvalgomis, horizontalioji komunikacija) leidžia geriau spręsti problemas ir sukurti didesnę vertę verslui.
- Egzistuoja verslo analitikos kultūros, kuri laikytina organizacinės ir informacinės kultūros dalimi, veiksnys, kuris skatina verslo analitikos informacinių poreikių tenkinimą didinant verslo vertę pažangaus informavimo dėka.

Disertacijos tyrimo rezultatų aprobavimas ir rezultatų skelbimas

Mokslinio darbo rezultatai yra aprobuoti ir paskelbti penkiose publikacijose, kurių sąrašas yra pateiktas šios santraukos dalyje LIST OF PUBLICATIONS. Mokslinio darbo rezultatai yra pristatyti trijose mokslinėse konferencijose ir vienoje mokslinėje-praktinėje konferencijoje, kurių sąrašas pateiktas šios santraukos 16 puslapyje.

Išvados ir pasiūlymai

1. Publikuotų mokslinių tyrimų analizė parodė, kad yra akivaizdus poreikis tirti žmogiškųjų veiksnių įtaką verslo analitikos sukuriamai vertei.
2. Publikuotų mokslinių tyrimų analizės rezultatai patvirtina poreikį tirti VA kultūrą kaip svarbų veiksni, kuris daro įtaką VA informacinių poreikių tenkinimui.
3. Apibendrinant mokslinės literatūros analizės rezultatus, darbe pavartoti pažangaus informavimo ir verslo analitikos kultūros terminai, atitinkamai apibrėžiantys:
 - aukštesniąją verslo informacinių poreikių sudėtingumo spektro dalį;
 - organizacinių ir individualių žmogiškųjų veiksnių visumą.
4. Mokslinės literatūros analizės rezultatai parodė, kad pagrindinis ir vertingiausias verslo analitikos ir pažangaus informavimo produktas yra įžvalgos, kurios savo ruožtu leidžia įgyti aiškų suvokimą apie situaciją, parinkti tolesnę veiksmų kryptį, rasti naują arba kitą būdą veikti, skatina keistis ir vystytis.
5. Tyrimas atskleidė, kad verslo analitikos informaciniai poreikiai yra glaudžiai susiję su informacinėmis ir ryšio technologijomis, tačiau nėra šių technologijų formuojami ir didesnę įtaką VA informaciniams poreikiams formuoti, tenkinti ir vystyti turi organizaciniai, vadybiniai, socialiniai ir psichologiniai aspektai – žmogiškieji veiksniai.
6. Tyrimo rezultatai leidžia teigti, kad VA technologijos automatizuoja daug rutininių verslo analitikos funkcijų, pagerina duomenų ir informacijos – žaliavos įžvalgoms – kokybę ir tokiu būdu sukuria reikšmingą suvokiamą vertę organizacijai ir sudaro prielaidų aukštesnio lygio analitinei veiklai.
7. Dalijimasis informacija, įžvalgomis, patirtimi yra išskiriamas kaip vienas iš kritinių verslo analitikos informacinių poreikių tenkinimo veiksnių, kuris turi teigiamą įtaką organizacinei veiklai. Tačiau tyrimas parodė, kad dalijimosi įžvalgomis skatinimas vis dar problemiškas – profesionalai vengia dalytis ekspertinėmis žiniomis. Didelę įtaką dalijimuisi įžvalgomis daro asmeninės kultūrinės vertybės ir organizacinė bei informacinė kultūra.

8. Tyrimo rezultatai parodė, kad kai organizacijoje yra sutvarkyti informaciniai procesai ir palaikomi žmogiškieji veiksniai (bendradarbiavimas, dalijimasis informacija ir įžvalgomis, horizontali komunikacija), problemos yra sprendžiamos geriau ir sukuriama didesnė suvokiama vertė verslui. Taip pat nustatyta, kad žmogiškieji veiksniai geriau atsiskleidžia padedant techniniams veiksniams, nes daugiau dėmesio galima skirti aukštesnio lygio problemoms spręsti ar gilesnėms įžvalgoms formuoti.
9. Tyrimo rezultatai atskleidė, kad visi sėkmingi atvejai, geresni pasiekti problemų sprendimo rezultatai, didesnė verslo analitikos naudojimo suvokta nauda verslui siejami su suvoktu aukštu VA kultūros lygiu. Neatsižvelgiant į tai, kad kultūra pati savaime yra sunkiai apčiuopiamas reiškiny, organizacijų vadovai gana objektyviai suvokia verslo analitikos kultūros egzistavimą ir stiprumą (lygi). Tyrimo rezultatai patvirtina, kad verslo analitikos kultūros veiksnys egzistuoja, o tai, kad jis siejamas su aukštais rezultatais, parodo VA kultūros lygio svarbą verslo analitikos diegimo ir naudojimo organizacijoje sėkmei.
10. Tiriamos dalykinės srities sudėtingumas nulėmė tai, kad disertacijoje tirta tik tam tikra VA probleminių momentų dalis. Tolesni išsamesni tyrimai turėtų būti skirti žmogiškiesiems veiksniams ir analitinei kultūrai siekiant geriau suvokti giluminę technologinių ir žmogiškųjų veiksnių priklausomybę. Tolesnių tyrimų prielaidos: informacijos dalijimasis turėtų pagerinti informacijos kokybę ir atitinkamai įžvalgų kokybę, nes analizuojant skirtingus analizės rezultatus ir išnagrinėjus jų skirtumų priežastis (palyginamus ar susijusius dalykus) atsiranda galimybė pastebėti neatitiktis.
11. Remiantis atlikto tyrimo rezultatais, diegiančioms VA organizacijoms reikėtų rekomenduoti verslo analitikos informacinę sistemą visų pirma vertinti ne tik kaip technologiją, o kaip informacijos valdymo visumą, kuriai diegti ir naudoti reikia apibrėžtos tvarkos, parengti žmones, ji apima formalią ir neformalią skatinančias dalis. VA sistema – pati savaime, nors ir yra labai pažangi technologija, VA diegimo ir naudojimo organizacijoje sėkmės neužtikrina. Sėkmingai VA sistemas diegti ir naudoti yra galima visų pirma gerai paruošus terpę – kai tinkamai sutvarkyti informaciniai procesai, gerai organizuoti ir valdomi žmogiškieji veiksniai, skatinama VA kultūra.

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Professional experience

The expert of ERP, CRM and BI systems with over 20 years of professional experience (from 1999 until now) in the implementation and managing of ERP, CRM and BI systems implementation projects in medium and large enterprises. An independent consultant in representing both business companies and public authorities as buyers and users of such systems for 15 years. Professional skills have been shaped through practical execution of the tasks of all ERP, CRM and BI systems implementation stages: from the analysis of organization needs, preparation of technical documentation and design of additional system functionality to the evaluation of the correspondence of the already existing company systems functionality with relevant business/operational needs and integration of systems into company/organization process, taking into consideration the strategy of a company/organization.

2011- 2017 an IT expert at the Lithuanian Business Support Agency. Performed the expertise of the IT part of the EU funded projects under such measures as E-Business, Intellect LT and Invest LT. Over 300 expertises performed.

From 2015 until now Junior Assistant Lector at Vilnius University Faculty of Economics.

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