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# **Business intelligence systems in the SaaS model as a tool supporting knowledge acquisition in the virtual organization.**

**Damian Dziembek**, Czestochowa University of Technology, dziembek@zim.pcz.pl

**Leszek Ziara**, Czestochowa University of Technology, ziora@zim.pcz.pl

## **Abstract**

*The aim of the article is to present the possibility of knowledge acquisition process support by Business Intelligence (BI) systems in the form of e-service Software as a Service (SaaS). In order to realize the above aim there was accepted the following course of action. At the beginning of the paper the problems of knowledge acquisition in virtual organizations were discussed. Then, the outline of BI systems was presented. Next, the possibilities of supporting knowledge acquisition for potential or real subjects of virtual organization using BI systems were indicated. In the final section, BI systems in the SaaS model which can support knowledge acquisition by subjects interested in participation or functioning in the virtual organization were briefly characterized. The article is summarized with the list of exemplary BI systems available in the SaaS model.*

**Keywords:** Business Intelligence Systems, virtual organization, software as a service, knowledge acquisition

## **Introduction**

The important role in the scope of supporting the process of knowledge acquisition in virtual organization is played by different types of Information Systems. The scale and dynamics of changes occurring in the contemporary business environment create the necessity for incessant improvement of current structures and the rules of enterprise functionality. Among various improvement activities, the reorganization of business processes is being undertaken and often demands temporary collaboration with other enterprises within the framework of virtual organization. The model of virtual organization is the form of dynamic and network cooperation of independent subjects which in time of collaboration unite their own resources for the realization of determining aim (usually of economic character). The main resource of virtual organization is the knowledge carried in by the generality of cooperating subjects. As an effect, the quality of knowledge resources of cooperating partners implies market efficiency and efficacy of virtual organization. Therefore, the process of knowledge acquisition plays a key role in the activity of the virtual organization.

## **The problems of knowledge acquisition in the virtual organization**

A virtual organization is perceived as the perspective model of doing business activity which can dynamically adapt itself to turbulence and growing requirements of contemporary business environment. The virtual organization can be defined as the temporary and variable form of cooperation of specialized and geographically dispersed economic units (persons, individual divisions of economic subjects or the whole of enterprises or institutions), co-dividing key abilities, resources, costs, and risk, and integrated into a coherent unit by tools and communication information technologies (IT); –this allows for the realization of a determined aim to which the generality of dynamically planned, carried out and constantly improving

(evolving) processes were subordinated (Dziembek, 2009). The main subject initiating and coordinating the activity of virtual organization of economic character is the integrator. The task of integrator is selection and consolidation of activities of specialized cooperating subjects which together will be able to realize the founded aim of the virtual organization which is realization of customers' orders.

In today's knowledge based economy, a basic resource deciding adaptive abilities, the market position, development possibilities and competitive advantage of both traditional and virtual organizations is knowledge. According to Tiwana (2003), knowledge is a liquid mixture of context experiences, values, information and skills forming frames for the assessment, understanding and assimilation of new experiences and information. Due to the fact that a virtual organization does not possess its own material components, it is necessary to accept strategic approach to intangible assets, and particularly to the problems of knowledge management. In management literature, knowledge is defined as the process whereby the organization generates wealth on the basis of its own intellectual or based on knowledge organizational assets (Bukowitz& Williams, 1999). In the virtual organization, knowledge management is an organized and systematically developed process which targets the proper joining of partners' knowledge resources (skills, experience, values and information assets) (Dziembek, 2012), making the following possible:

- Dynamic and flexible reaction to changing environment conditions, and particularly the quick identification and utilization of appearing chances (gaining of orders) and the rapid minimization of perceived threats.
- Generating values for the customer (high efficacy, quality and efficiency of economic processes makes possible the generating of more perfect, innovative and "knowledge-absorptive" products).
- Effective achievement of appointed aims and proper management of current business activity of virtual organization (e.g. appropriate realization of planned business strategy, better communication and quick taking of proper decisions, optimum configuration of indispensable resources for execution of order, shortening product creation lifecycle, avoidance of errors copying, higher profitability, reduction of the management risk and in effect maximization of economic advantages, etc.)
- Learning of subjects forming virtual organization (improvement of key competencies and development of new skills) improving both its own market position and the potential of the whole virtual organization

The market variability and requirement of the customer dictates that the absolute requirement is not only possession of specialist knowledge by every market unit, but also permanent updating, acquisition and development of knowledge resources. Virtual organizations are founded on the high-quality of immaterial components, related to the network and connecting partners of virtual organizations, suppliers, and the customer. Immaterial components aggregated in the virtual organization undergo evolution with the tendency for development of possessing knowledge resources by individual subjects. Each of the subjects being potential or existing participant of the virtual organization should in turn pay considerable attention to systematic learning and the acquisition of knowledge (including transformation of information gained in the way of

interaction and collaboration with other market participants' information resources into knowledge). The quantity and quality of knowledge resources possessed by a given subject, determine the possibility of its participation in the virtual organization, and the common realization of customer's order. The Integrator is a qualified subject, possessing the skill of its own knowledge asset enhancement and creating a proper climate in the virtual organization; it facilitates cooperating subjects, both in the development of current, and in the acquisition of new knowledge assets.

In the processes of knowledge management realized both in traditional and virtual organizations, an important element is the acquisition of knowledge. Generally the acquisition of knowledge consists of enhancement in the quantity and quality of accessible immaterial resources, i.e. skills, experiences, values, attitudes and information assets, indispensable for the achievement of founded aims. The acquisition of knowledge can be an effect of undertaking activities by single persons, as well as teams of people. The acquisition of knowledge should be directed at the achievement of founded goals of the organization. According to Gołuchowski (2005), the knowledge can be created inside and outside the organization, therefore the acquisition (the enhancement) of knowledge resources embraces activities oriented to the creation of knowledge inside the organization and on its acquisition from the environment. Further, according to Nycz (2007), the acquisition of new knowledge is a function of human possibilities of drawing logical conclusions concerning new relations occurring between rules, circumstances or final desired effects, and expressions of its semiotic interpretations, which consequently makes possible creation of new meanings and models from existing facts. The acquisition of knowledge in the organization means its acquisition from sources where it is supposed to be found. These are sources connected with so called human factors, sources in the traditional form (i.e. paper documentation), and digital form (e.g. databases and data warehouses, document bases, including hypertext documents, documents accessible via the Internet, and multimedia bases) (Nycz).

The acquisition of knowledge by existing or potential participants of virtual organization, i.e. the Integrator and cooperating subjects, takes place in all phases of the virtual organization's life cycle, which are analysis, planning, organization, realization as well as the development or solution. It should be noted that a virtual organization is created only in the phase where organization and subjects become real cooperators in the virtual organization. In earlier phases, i.e. analysis and planning, subjects are considered potential participants of the virtual organization. Table 1 outlined the acquisition of knowledge taking place in individual stages of a virtual organization's activity. The acquisition and possession of suitable knowledge allow for undertaking proper decisions in relation to the choice of the customer's order, calling up Integrator, and then the selection of cooperating subjects. In effect the virtual organization is created possessing knowledge assets and other resources, indispensable and at the same time sufficient to the realization of customer's order.

The knowledge acquisition in the virtual organization is considered both in reference to single subjects, and in reference to the group of cooperating people or organizations and in collaboration of cooperators with the environment (with other organizations and customers). The efficient and effective knowledge acquisition is especially essential for the potential integrator of virtual organization because acquired knowledge in conjunction with its current intellectual

potential will facilitate making a decision concerning vocation virtual organizations and performing the function of a leader.

Table 1. Knowledge acquisition and lifecycle of virtual organization

<b>Lifecycle phase of virtual organization and knowledge acquisition</b>
<p><b>Analysis</b> – In this phase the subject interested in the role of the Integrator of virtual organization accumulates essential data, converts it to valuable information and accumulates the knowledge about potential of demand and supply in the market. The potential integrator considering the meaning of virtual organization creation performs in parallel the task of exploratory-analytic activities targeting acquisition of information and knowledge in relation to: - competence of subjects functioning in the market environment (recognition of price/quality relation of possessed knowledge resources of potential subjects cooperating in virtual organization) and settlement of the degree of its participation interest in network ventures such as virtual organization; - market chances i.e. potential orders of customers together with settlement of essential parameters of required product by the customer (e.g. regarding volume of demand, price, quality, technology, time of realization, prospective profits, possibilities of competitors, etc.); - the potential of customers (financial situation, flexibility of operation, market rating, readiness to co-creation of product, awaited tools and forms of communication, etc.); - market trends, applied and future technologies, environmental requirements, legal conditionings, economic position. The acquisition of knowledge in the first phase of the virtual organization's life cycle "analysis" is also essential for economic units interested in the role of cooperating subjects. This group of subjects should acquire knowledge in relation to its own possibilities and competences, readiness and abilities of its own staff to cooperation within the framework of network economic structures, and lists of possible advantages and threats connected with participation in virtual organization.</p>
<p><b>Planning</b> – In this phase, the potential integrator processes information and acquires knowledge concerning advisability of virtual organization vocation. The potential integrator on the basis of market research, defines the list of customers' orders which can be realized by the group of competent subjects interested in cooperation within the framework of a virtual organization. Then, the most profitable orders are selected and also competences of partners fully sufficient to reach required parameters of product. The integrator should acquire detailed knowledge concerning tangible and intangible assets of its potential partners e.g. specialization, skills and experience (knowledge), applied technology, price and quality of service, etc. At this stage the subject interested in the role of integrator should also define how aggregated knowledge resources of the generality of partners will deliver the value added to the product delivered to customer in relation to other competitive organizations. The planning phase completes the preliminary definition of both roles and assignments of individual subjects in the scope of virtual organization and preliminary design of the realized processes. This in effect will lead to the best realization of customer's order. The enterprise interested in the role of cooperating subject should in the planning phase, acquire the knowledge in relation to its own role in achievement of virtual organization's goal, indispensable resources for realization of customer's order, and reverses difficulties in customer's order realization.</p>
<p><b>Organization</b> – In this phase, the integrator makes the final choice of customer's order for realization, and fixes the subjective structure of virtual organization. Here, the integrator (excluding possession of knowledge concerning project management), must acquire knowledge in relation to actual readiness of selected cooperating subjects for cooperation within the framework of the virtual organization and difficulties which concern and may concern network cooperation (e.g. exceeded time, insufficient resources, unclear aims and requirements, breaches of qualitative parameters, incorrectly estimated costs, improper commitment of the customer, etc.). The enterprise interested in the role of cooperating subjects should, in the organization phase, acquire the knowledge concerning sharing functions, schedule its execution, determine the range of subjects responsibilities, rules of collaboration, and rules of works calculation together with defining the course of realized business processes in virtual organization.</p>

**Realization** – In this phase, the integrator together with the group of cooperating subjects, realize business processes which target delivering product with the requirements of customer. The integrator constantly acquires knowledge concerning current work progress in virtual organization that will allow them to take coordinating actions. Partners of virtual organization, during mutually realized processes, will divide the knowledge among themselves, improve and develop their own knowledge, and acquire new knowledge from their environment (e.g. from customers, suppliers, cooperators) concerning prognosed trends, technologies and new market phenomena within products range. In this phase the acquisition of knowledge from the customer in the scope of new and evolving needs and requirements (transfer of proposals, ideas, attentions and recommendations concerning product produced by virtual organization) takes place. The product delivered by the virtual organization is both a "knowledge absorbing" product (basing itself on specialist knowledge) and a "virtual" product, appearing in cooperation with the customer, fulfilling his requirements concerning quality, costs, and time of its creation and delivery. Within the virtual organizations, the designing of the product, and initial product testing takes place repeatedly. Consequently, the virtual organization in the realization phase constantly acquires and updates the knowledge concerning the customer, which should have an influence on shortening of the cycle of product creation and the utility and innovativeness of mutually created products.

**Development** – In this stage, improvement activities for both the structure and virtual organization processes, takes place to determine how to best realize the customer's order. Constant knowledge acquisition concerning various aspects of the virtual organization's activity and changes happening in the environment becomes a base for structural evolution, and processes or technological solution evolution in the virtual organization. An effect of evolution can be reconfiguration of subjective structure of the virtual organization (also embracing the integrator). This can necessitate the call for collaboration within the framework of the virtual organization of others interested in cooperation units. New subjects qualified for collaboration will share their own knowledge with current partners of the organization and with customers, allowing for all community of mentioned subjects to update and develop possessed knowledge and to acquire new ones.

**Dissolution** – In this last phase of the virtual organization's activity, the settlement of its activity and discontinuation, dispersion of aggregated assets of knowledge takes place. The end of the activities of the virtual organization will be finalized with the settlement of orders and the distribution of profits. This is usually subordinated from the meaning of knowledge carried into the virtual organization by a given subject for creation of customer's value. With the end of business activities, the integrator and individual subjects' estimate efficiency indicators for realized order, and as a result, brings knowledge acquisition concerning financial result, efficiency of undertaken activities, efficiency of processes, assessment of customer and market, and further prognoses concerning advisability of cooperation treat in the scope of virtual organization. The partners acting independently would probably not obtain such a knowledge acquired in progress of cooperation within the framework of virtual organization and this knowledge may be especially valuable in quests of following orders and start over of cooperation within the framework of another virtual organization.

This paper focuses exclusively on the discussion of possibilities of supporting knowledge acquisition realized by potential or existing participants of virtual organization by knowledge acquisition coming directly from electronic sources of organization (e.g. databases) or gained indirectly from its environment (e.g. Internet resources). In order to support knowledge acquisition, various methods, technologies and tools can be applied. The main tool supporting knowledge acquisition by acting subjects or those considering participation in virtual organization can be Business Intelligence (BI) systems (Olzak, 2003). Moreover information obtained from BI systems can be transformed into the knowledge via the techniques of knowledge exploration, but this aspect will not be presented in this paper.

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## **Business Intelligence Systems – notion and scope of functionality**

BI systems constitute integrated environments, aimed at intelligent joining of different information, its multidimensional analysis, and presentation in many arrangements and perspectives (Olzak, 2003). Turban, Sharda, & Delen (2006) defined BI as “a broad category of applications and techniques for gathering, storing, analyzing, and providing access to data in order to help enterprise user make better business and strategic decisions.” BI systems integrating processes, technologies and tools, supply complex perspective in reference to business operations, customers, partners and suppliers, economic situation, and even competitors supporting decision processes. Originally BI systems were dedicated for executive management of organizations, however, presently they can support decision-makers at every level of management. BI systems enable processing of data aggregated in different systems implemented in an organization. The main data sources for BI systems are transactional systems such as enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management (SCM) systems. Data can be also received from spreadsheet files, specialist databases, mail programs and the intranet. The scope of BI systems (except information resources describing the interior of the organization) extends to data aggregated in the market (e.g. data on business partners) environment. Thanks to the lower costs of BI systems, they are currently implemented in a greater number of firms and can embrace within its range almost all areas of an enterprise activity. The BI system consists of several key-components, such as:

- Extract, transform, and Load (ETL) tools - responsible for the extraction of data from source systems, transformation, processing and upload to data repositories.
- Data repositories - warehouses and data marts (relational bases, OLAP cubes), aimed at the storage of gathered data from information technology (IT) systems and making them available to users.
- Analytic and reporting tools - consisting of data model and tools, making the interface and assuring user interaction with data, and enabling transformation of data into information. The most common types of analytical tools include: query tools, reporting tools, online analytical processing (OLAP) tools, data mining tools (enabling application of statistical and machine learning methods on data sets available in the repositories, and oriented on knowledge discovery by its exploration), control panels, and advanced analytical solutions (What-if scenarios, optimization, statistical analyses, etc.).
- Corporate portal - the layer across which users have access to most of the tools and the place, making possible cooperation and exchange of reports and analyses.

Additionally, BI systems consist of different types of advanced applications, making possible, among other things, the performance of different type of analyses (e.g. planning, budgeting), implementation of the Balanced Scorecard, Activity Based Costing, and the creation of visualization.

Nowadays, many BI systems are characterized by the possibility of receiving data from multiple different and often dispersed sources (e.g. Internet portals) and enabling results in the form of reports and analyses via Internet browsers. Reports and analyses present data and information in the form of tables, graphs or other graphic elements, facilitating its understanding and interpretation by the management of the organization. The information contained in these reports

may become an essential component of knowledge, if it will be used as the basis of managerial decision-making. An intention of BI systems is the delivery of proper information to the proper persons in due time, which should support decision making and allow the taking of actions leading to the achievement of a competitive edge. BI systems provide both information and knowledge that leverage a variety of the data sources. Knowledge is derived from information but is more robust as it offers “justified beliefs about relationships relevant to the decision,” (Sabherwal & Becerra-Fernandez, 2011). An effect of Business Intelligence tools application is the accessibility to information and knowledge acquisition concerning customers, competition, business partners, economic situation, and internal operations (Liautaud & Hammond, 2003).

Basic advantages connected with implementation of BI system concern:

1. Getting in one place reliable and coherent data and information from all areas of an organization's activity
2. Facilitated access to data coming from different sources (including dispersed sources from the environment)
3. Shortening the time of analysis, decision making and increasing efficiency of management
4. Efficient planning, simulation and prognosis in different angles
5. Quick reaction to appearing market trends, detection of threats and chances in the area of leading activity
6. Current analysis of financial situation and tracking budget deviation, financial optimization of undertaking activities
7. Lowering the number of persons involved in decision making processes (involved in the analyses)
8. Increase of efficiency and efficacy of undertaking decisions what has an influence on the possibility income growth, reduction of costs and improvement of customer's satisfaction.

Beside the earlier mentioned advantages, BI systems can have an influence on the stimulation of creativity and innovativeness in the organization and the creation of better relations with customers and business partners. Effects and advantages which the organization may achieve based on the utilization of BI system are dependent on the skilful utilization of obtained information and acquired knowledge by specific decision makers. Acquired knowledge by decision makers should be transferred on conscious and effective economic activities. It is important to underline that the competitiveness of contemporary organizations more and more often is dependent on the skill of using BI systems by managers.

### **Capabilities of BI systems in supporting knowledge acquisition in virtual organizations**

One of the essential elements of knowledge management system in both traditional and virtual organizations is IT. Various IT solutions (e.g. BI Systems) facilitate the storage and availability of IT resources, making it an important supporting tool for managers in the scope of acquiring and expanding their own knowledge. Acquired knowledge becomes a base for accurate managerial decision making, having an impact on the proper functioning and development of

business activity. It is worth highlighting that the acquisition of knowledge in the traditional and virtual organization can take place at the level of individuals, groups of cooperators or collaborators within the environment.

BI systems can in a significant way support the subjects interest in functionality or already existing in the scope of the virtual organization i.e. integrator and cooperating subjects. Each subject possessing its own data resources stored in a digital form and using a different type of data located in the environment and made available via the Internet, can acquire crucial information supporting enhancement of current knowledge and the acquisition of new knowledge. BI systems applied by potential or existing virtual organization's participants have three main goals:

- Ensuring immediate access to the information and knowledge acquisition related to appropriateness of taking part in virtual organization/establishing virtual organization
- Support of the decision making process concerning current and future business activity of virtual organization
- Learning and knowledge acquisition concerning processes and phenomena occurring inside of virtual organization and its environment

Table 2 indicates exemplary possibilities of supporting knowledge acquisition by potential and existing partners of virtual organization based on topic areas articulated by Liautaud and Hammond (2003), i.e. customers, competition, business partners, economic situation, internal operations, additionally extended to market areas. In general BI systems applied by potential/existing partners of virtual organization should support knowledge acquisition, which is indispensable for the purpose of decision making in the area of tangible and intangible resource optimization, increasing efficacy and efficiency of undertaking activities, achievement of intended goals and indication of threats and opportunities coming from the interior and environment of virtual organization.

Table 2. Capabilities of BI system in the scope of information and knowledge acquisition of potential and existing participants of virtual organization

<b>Capabilities of BI system in the scope of information and knowledge acquisition of potential and existing participants of virtual organization</b>	Lifecycle phase of virtual organization in which acquisition of information and knowledge is essential					
<b>Customers</b> By creation of different types of analyses and reports in BI system, acquisition of information and knowledge concerning:	Analysis	Planning	Organizing	Realization	Development	Dissolution
Current and future needs and preferences of customer and concerning product specificity which should be provided by virtual organization.	V	V	V	V	V	V
Profile of a potential customer and analysis of expected income from order (what allows to evaluate efficiency of virtual organization and share profits among virtual organization's partners depending on contributed knowledge assets).	V	V				



Potential costs of order realization (i.e. product fulfilling client's expectations).	V	V					
Possibilities of realization of specific customer's order considering term, costs, available resources in organization and environment.	V	V	V				
The number of potential customers interested in products offered by virtual organization.	V	V			V		
Problems reported by costumers concerning given product.	V	V		V	V	V	
Getting a product by a customer.	V	V		V	V	V	
The most profitable orders from client.	V	V					
<b>Competition</b> By preparation of a different type of reports and analyses in BI system, <b>acquisition of information and knowledge</b> concerning:		Analysis	Planning	Organization	Realization	Development	Dissolution
List and comparison in respect of market criteria of the most important customers.	V				V		
Types, quality and price parameters of current products provided to customers by competitors.	V	V			V		
Problems concerning realization of similar orders by competitors.	V						
An opinion concerning business activity and products of virtual organization.				V	V	V	
<b>Business partners (potential/existing cooperators of virtual organization)</b> By preparation of a different type of reports and analyses in BI system, <b>acquisition of information and knowledge</b> concerning:		Analysis	Planning	Organization	Realization	Development	Dissolution
Capabilities and competences of potential and currently involved cooperators in virtual organization (network cooperation ability).	V	V	V	V	V	V	
Possibilities of task assignment according to possessed specialization and/or location of cooperators.			V	V		V	
Planning the structure of virtual organization, optimizing its composition concerning competences indispensable for the realization of a given customer's order (identification of supply chain, networks of quality).			V			V	
Required amount and the cost of materials, half-finished products and services purchase necessary for appropriate realization of customer's order.	V	V		V			
Realization of assigned tasks by following cooperators.			V		V	V	V
Satisfaction concerning cooperation in the scope of virtual organization.					V	V	V
Risk of mutual realization of order.	V	V	V	V	V	V	V
<b>Economic situation</b> By preparation of a different type of reports and analyses in BI system, <b>acquisition of information and knowledge</b> concerning:		Analysis	Planning	Organization	Realization	Development	Dissolution
Economic status of subject, justifying participation in virtual organizations.	V	V	V	V	V	V	
Level of costs indispensable for realization of order.	V	V					
Deviation from assumed level of order's cost.					V	V	V
Economic risk of order realization in the scope of virtual organization.	V	V			V	V	
Prognoses of financial effects concerning realization of a given order in the scope of virtual	V	V				V	V

	Analysis	Planning	Organization	Realization	Development	Dissolution
organization, (order's profitability).						
<b>Internal operations</b> (mutually realized business processes in the scope of virtual organization) By preparation of a different type of reports and analyses in BI system, <b>acquisition of information and knowledge</b> concerning:						
Identification of its own key and unique skills compared to other subjects,.	V	V			V	V
Potential and real costs of customer acquisition and maintenance (marketing and sales costs).	V	V		V		V
Costs of labor, time, terms and quality parameters of mutually realized economic processes in virtual organizations.		V	V	V	V	V
Current status of business processes realization.				V	V	
Deviation from planned parameters of business processes.				V	V	V
Effects of mutually realized business processes in virtual organizations.		V			V	V
Directions of operations, optimizing parameters of entry and exit resources.			V		V	V
Possibilities of optimization of business processes realization.			V		V	V
<b>Market</b> By preparation of a different type of reports and analyses in BI system, <b>acquisition of information and knowledge</b> concerning:						
Specificity and market requirements in which business activity of virtual organization is conducted.	V				V	
Opportunities and market niches, possibilities of its realization in the scope of virtual organization.	V	V			V	
Trends and market tendencies.	V	V			V	V
Absorption capacity of market (realization of the same order in the interest of other customers).	V	V				V
Market effects of order's realization (market share before and after realization of order).	V					V

The application of BI allows subjects interested in participation in virtual organization to acquire knowledge concerning appropriateness of accession to a virtual organization. Acquirement of new assets of knowledge arising in mutual realization of processes and learning of cooperators is valuable. The special role should be played by integrator inspiring and encouraging the division and acquisition of the precious resources of knowledge by all participants of virtual organization. Acquisition of knowledge in relation to customer, market, partners, competition, economic situation and business processes becomes a base for decision making concerning realization of operating and improving activities in virtual organizations. The value of acquired knowledge by the generality of virtual organization's partners will manifest in the skill of aggregated assets of knowledge utilization for the purpose of analysis and redesigning of processes, structure and product in virtual organizations. Besides, in dynamic virtual organizations the important role is also played by the speed of acquisition and usage of knowledge in digital and network environment as well as a permanent improvement of the generality of processes and tools of knowledge management.

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## **BI system usage in the SaaS model in virtual organization**

Nowadays, as a result of IT tools and resources development, the competition among IT suppliers and dissemination of broadband Internet, network access, BI systems may be offered in the form of e-services, i.e. as Software as a Service (SaaS) also known as on-demand BI, BI services on demand or cloud BI. Generally the SaaS model is a form of IT e-services in which the external supplier makes available and maintains in the internet space different types of IT systems and recipients (e.g. enterprises, institutions) after being charged, can use them remotely. SaaS (in addition to infrastructure as a service [IaaS] and platform as a service [PaaS]) is a model of services contained in Cloud Computing.

The provider of application in the SaaS model is responsible for the correct functioning of available software (i.e. its installation, modification, technical support, maintenance and security of stored data). For the purpose of application usage in the SaaS model, only computer systems (desktop computers, laptops, netbooks, tablets and other devices) with access to the Internet are required, and used for input and/or data display. The internet browser constitutes communication interface of the customer with used software. Using such a solution, employees, regardless of their physical location can use different IT systems in the 24/7/365 mode. Charges for applications used in the SaaS model are dependent on service time and functional range of rented software.

BI systems in the SaaS model use and replicate databases from indicated resources and make its update in establishing time fragments. Then via various tools, the user can subject the data to the analysis aggregated in the cloud data resources. All reports and analytic functions are accessible in comfortable interface which is usually the Internet browser. BI systems in the Software as a Service constitute virtual, dynamic, scalable and massive infrastructure embracing following components (Muntean & Surcel, 2013):

- Packaged software-as-service BI applications that can be deployed in a cloud environment.
- SaaS BI tools that can be used to develop BI applications for deployment in a cloud computing.
- On-premises environment and data warehousing in the cloud.

BI systems in the SaaS model are quickly accessible analytic platform for different type of subjects which do not want or cannot apply traditional solutions. A time limit for BI system usage in the SaaS model is only restricted by importing data or configuration of analysis or report in the angle of required users' needs. It seems natural that users of BI in the SaaS model will be these subjects which possess positive experiences in utilization of other systems (e.g. ERP, CRM, etc.) accessible in the cloud.

The traditional model of BI system (on-premise) required considerable primary purchasing costs of the indispensable equipment, software and services. The dynamics of business activity, pressure on lowering costs, mobility of staff, and local dispersion of individuals, causes subjects interested in cooperation or functioning in virtual organization to consider the application of highly flexible IT solutions such as the SaaS model. As a result, many suppliers accept traditional forms of license sale offered also by BI systems in the service (on-demand) model. The usage of BI systems in the SaaS model by potential/existing participants of virtual

organizations, allows them to concentrate on its own primary activity (the creation of decision making reports and analyses), and not on installation, configuration and maintenance of often complex IT infrastructure. The exploitation of BI systems in the SaaS model is characterized with a profit relation concerning price/quality, though with this form of exploitation there are also certain associated dangers. Table 3 identifies the main advantages and threats connected with BI systems application in the form of SaaS with relation to the traditional on-premise model.

Table 3. Benefits and threats connected with the usage of BI systems in a SaaS model

<b>Benefits</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>- Lack of the necessity of IT infrastructure purchase (low entry costs).</li> <li>- Lack of the necessity of BI system installation at the user's site.</li> <li>- Fast and easy implementation.</li> <li>- Smaller demand on IT staff.</li> <li>- Relatively lower costs of gaining, maintenance and development of IT resources.</li> <li>- Greater predictability of IT costs.</li> <li>- Access to BI systems from any place at any time - 24/7/365 mode.</li> <li>- Reduction of investment risk in the scope of information-communication technologies.</li> <li>- High flexibility, scalability and efficiency of available BI systems.</li> <li>- Carriage of responsibility for functioning and development of BI systems on the provider and concentration of recipients on their own primary business activity.</li> <li>- High level of BI systems security.</li> <li>- Professional technical support and the service provided by specialized supplier.</li> <li>- The possibility of taking advantage of advanced BI systems previously reserved exclusively for large organizations.</li> </ul>	<ul style="list-style-type: none"> <li>- Failures of the Internet making impossible access and utilization of BI system.</li> <li>- Probability of appearing temporary lowering of - BI performance decrease due to lower Internet bandwidth.</li> <li>- Necessity of occurrence of high expenses on broadband Internet.</li> <li>- Partial user's dependence on external supplier of BI system.</li> <li>- Anxieties and problems concerning data security in BI systems administered by external provider (e.g. Bankruptcy of provider, security of data sent to BI systems and the risk of incomplete data removal in BI system).</li> <li>- Occurrence of essential functional differences between BI system offered in the SaaS model and on-premise model.</li> <li>- The possibility of legal problem's occurrence (different regulations in different countries, disadvantageous statements in contracts, lack of conducting standards, etc.).</li> <li>- Loss of governance.</li> <li>- Compliance risks.</li> <li>- Management interface compromise.</li> </ul>

Source: Authors' own study based on Dziembek 2010

Every potential or existing subject of a virtual organization interested in BI system usage should thoroughly analyze prospective advantages and potential threats connected with such form of IT system utilization. It is worth highlighting that it is not in every case presented that the advantages of BI system usage in the SaaS model will be perceptible and measurable for users. Specific features in relation to the user of a given BI system, the course of implementation and the approach and professionalism of provider will determine the occurrence and measurability of

presented advantages. Nowadays a large number of BI systems offered by the providers on the domestic and foreign market in the SaaS model exist. In the table 4 were presented an exemplary list of BI systems offered in the SaaS model which Polish or foreign subjects considering participation or work in the structure of domestic or international virtual organization can apply for the purpose of knowledge acquisition.

Table 4. Exemplary list of BI systems offered in the SaaS model

<p><b>BI systems in the SaaS model dedicated for subjects interested or functioning in the scope of domestic (Polish) virtual organizations</b></p> <p>Comarch Bussines Intelligence, Comarch ERP Optima Analizy BI, Comarch ERP XL BI, Comarch SFA Online Sales Support, Comarch Smart Analytics/COMARCH, Dynamic Data Web/QUITERIAN, EURECA/Controlling Systems sp. z o.o, IBM Business Analytics (Cognos and SPSS)/IBM Corporation, InForum BI Studio/DomData AG sp. z o.o, Integra/Sagra Technology sp. z o.o, INTENSE Business Intelligence Platform/INTENSE Group, Knowledge and WF-Analizy/ Asseco Business Solutions SA, Microsoft Business Intelligence/ Microsoft, Microstrategy/ Microstrategy, N-Expert/BMS Creative, QlikView 11.20/Qliktech, SAP BusinessObjects/SAP, TrimTab One/ Trimtab SA, Xpertis BI/Macrologic.</p>
<p><b>BI systems in the SaaS model dedicated for subjects interested or functioning in the scope of international virtual organizations</b></p> <p>Belladati/Trgiman, Bime/Bime Analytics, Birst/Birst, Centius Qi/Centius, Easy Insight/Easy Insight, Indicee Reporting /Indicee, Zoho Reports/Zoho Corporation.</p>

The above BI systems in the SaaS model possess different functionality and are dedicated for subjects of different size and from various branches. The level of supporting knowledge acquisition may also differ. Every potential/existing subject of virtual organization should be precise in its needs in the scope of knowledge which it would like to acquire and collate with the functionality of BI system in the SaaS model. The selection of BI system in the SaaS model may be done by considering many criteria e.g. functionality, brand, price and flexibility in the scope exploitation fee, possibility of integration with different type of data, quality of maintenance support, speed of reaction to announced problem situations, level of applied protections, market share of BI providers, terms of contract concerning purchase, exploitation and resignation (service level agreement [SLA]), amount of users of the services, users' opinions, possessed certificates (e.g. ISO), etc. The final decision should be preceded by BI testing and actual confirmation of system's usefulness for knowledge acquisition purpose and fulfillment of all previously defined criteria. BI systems in the SaaS model offering are still being enhanced increasing selection possibilities for subjects interested in participation or functioning in the structure of virtual organization. Systematic improvement of BI systems offered in SaaS solution taking place in the technological and functional aspect will surely favor systematic leveling of the mentioned threats.

### Summary

Systematic knowledge acquisition is a necessity both in traditional and virtual organizations functioning in the dynamic market environment. One way of supporting knowledge acquisition by potential or existing participants of virtual organization is the use of BI systems. The knowledge gained, thanks to BI systems, concerning status of resources and functionality of

processes inside a given subject virtual organization and the environment lets on the maintenance or improvement of market position. Particularly BI systems allow potential or existing participants of virtual organization to acquire the knowledge concerning customers, competition, market, business partners, economic situation, and internal operations (processes).

One of interesting models of access and utilization of IT resources is the SaaS model. Nowadays wide offerings of BI systems in the service model is available, which can find its application in knowledge acquisition by subjects considering participation in virtual organization and individuals already participating in this type of cooperation. BI systems offered in the SaaS model offer many advantages to potential and existing subjects interested in taking part in virtual organization, however with the service form of IT systems utilization are also connected certain threats. Prospective advantages and threats should be thoroughly analyzed by all subjects interested in supporting knowledge acquisition via BI systems offered in the SaaS model.

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## **Biographies**

**Damian Dziembek Ph.D.**, employed as Assistant Professor at Czestochowa University of Technology, the Faculty of Management, Business Informatics Department. He is the author of over 70 papers published in domestic and international journals. His scientific interests include knowledge management, virtual organizations, data security and business process modeling. He is member of Scientific Association of Business Informatics.

**Leszek Ziora Ph.D.**, employed as Assistant Professor at Czestochowa University of Technology, the Faculty of Management, Business Informatics Department. He is the author of over 30 papers published in domestic and international journals. His scientific interests include Business Intelligence systems, data security in computer networks, big data and cloud computing solutions, application of linguistics in management. He is member of Scientific Association of Business Informatics and International Association of Engineers.