Knowledge Management as Foundation of Smart University

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Abstract—**Functioning in an era of knowledge is forcing organizations to manage this valuable resource in exact way. Very frequently activities of organizations are dependent on the application of knowledge, sometimes even means "to be or not to be" for enterprise. Nowadays, to fulfill business goals of institutions it becomes fundamental for them to use intelligent systems supporting comprehensive management of the organization. Such support allows to increase efficiency and better effectiveness of the running businesses. As we are living in age of international integration, where world economy is tending to reach type of knowledge-based economy (KBE), universities are forced also to change way of their functioning. It is important for modern universities to be not only education centers but mainly the successfully prospering organizations-based-on-knowledge. Such approach is going to provide higher competitiveness of particular institution and will make its functioning more useful for economy of the region. Implementing a comprehensive and intelligent IT solution within a university and providing educational services, which are personalized to the needs of the market, will allow universities to reach a type of institution called "smart". The aim of the paper is explanation why university centers should evolve in a type of institution based on knowledge. The paper is managed as follows. After short introduction concerning research context the discussed concepts of Knowledge Management and Smart Universities are presented. In the main section real examples of Knowledge Management Systems implementation and examples of Smart Universities are investigated in order to identify and describe roles of Knowledge Management Systems in this area. It allows for formulation conclusions on intersection of two investigated approaches.**

I. INTRODUCTION

IT IS noticeable, that particular word countries are realizing implementation process of knowledge-based economy concept within its own economies. Such step is treated from scientific point of view as a fundamental step for the implementation and maintenance of balanced development of the country. Today, where the management is based on knowledge, it is crucial to use new technologies as a support of decision making process in organization. Currently main factors of entrepreneurship are: highly qualified human capital, universities, along with research centres, IT infrastructure and legal environment conducive to the construction and development of selected sectors of the economy. Accordingly, key elements of the knowledge-based economy in the modern management model becomes important to generate rapid pace of intangible capital, the implementation of innovation in every possible aspect of the business environment and the generation of high-quality knowledge.[24]

Terms of the knowledge economy is crucial for the functioning of businesses. Even Peter Drucker - recognized in the world as the father of modern concepts of management - management expert said that traditional enterprise resources such as land, labour, capital, constitute a bigger barrier than the driving force behind the development of the company. According to Drucker, a mission-critical determinant of creativity in all aspects of the knowledge.[8] Following Drucker, knowledge is a key factor determining the existence of the company and gives the public a new, unique character.[22] In addition, it is important to pay attention to the fact that it is impossible to say about the delivery of the knowledge-based economy, while acting within state organizations - including the institutions do not operate on the basis of the knowledge management process. Hence adopted to say that organizations which take into account aspects related to the management of knowledge management are called knowledge-based businesses. For the purposes of this article, for such an undertaking means an organization that "actively create knowledge and can use it in their daily activities"[14]. In addition, it is needed to note that the creation of knowledge is not only a task of companies involved in the provision of purely market knowledge but should manifest itself in the functioning of each operator - which in turn implies KBE.

How organizations generate and manage knowledge, which information systems are used to support such process, why universities can be classified as a corporation and for what reason authors tried to nominate them as a "smart" is going to be describe in this paper. Article will therefore include the characteristics of the company knowledge, a description of the key concepts of knowledge management, including meaning of information in order to present the essence of having intelligent solutions within the organization. In next sections it will be also explained why universities should be seen as the company providing the market "creative people" (called "smart people"), through the provision of educational services, functioning on the basis of intelligent information solutions.

II. COMPANY KNOWLEDGE

Knowledge is not only one of the key resources of the enterprise, but also is the foundation, the starting point for determining the company's strategy, particularly for the implementation of management information systems. Knowledge of the computer science is defined, in part, dependent on the data and information. The data does set of facts, measurements, statistics. Information, in turn, is nothing more than structured data. Thus, in this sense, knowledge is a collection of information that can be used in practice. However, the organization cannot exist without human capital, so to be able to say that the company has the knowledge, it is needed to take into account in addition to possession of selected information skills, experience and qualifications of specialists in selected fields. The combination of these two elements is a complete understanding of each company. Pay attention to the continuity of the process of converting data into information and information into knowledge. [2]

Because of the persistence of the two currents are still classifying knowledge: as an information resource and as an element of human capital. Each company needs both of these resources to function properly, so it is reasonable to say that knowledge is nothing else than "a combination of everything: facts, phenomena and relationships between them, which is consciously perceived and recorded (in any way saved as real entities or conceptual) and can give to others, according to the intention of having knowledge in specific conditions and circumstances to arouse certain behaviours". [6]

This is how the company manages knowledge depends on how knowledge in the enterprise is defined and what type it is preferred to carry out their activities. In theory, knowledge management is distinguished by personalized knowledge, which consists of the explicit knowledge and discreet. The formal knowledge are recognized as a formal document prosperity of the organization. However, informal knowledge - discreet, is nothing else but the skills, qualifications and experience of the employees. This knowledge is nowhere recorded, is set in their minds, so there is a barrier to capture the sensitive knowledge of that. [19] However, there is no longer a barrier to overcome. The knowledge of a discreet, distinguished by the so-called core, which allows the conversion of that knowledge in a standardized, codified form and vice versa. Due to the prevailing organizational culture within the organization and information system properly prepared can be personalized to gather knowledge and to process it and share as needed to other members of the organization. Although, it is depended on employee what part of knowledge is he/she going to "give" the company, it is also possible by using suitably generated mechanisms of organizational learning. Supporting such process, company is able to obtain a well-established knowledge that remains within its borders regardless of the availability of human capital.[16]

III. KNOWLEDGE MANAGEMENT

Being aware of all possible kinds of company's knowledge resources and knowing value of this crucial factor, it automatically refers to the essence of knowledge management, treated as a priority in the strategic management techniques. Knowledge management, as a young field of management encompasses the latest methods and techniques that are designed to provide most spectacular use of knowledge.[15] To make it more detailed, "knowledge management system is a modern concept, involving the effective use of knowledge and transforming the company into a lasting value for customers and employees of the organization"[20]. Moving forward, "knowledge management is clearly defined and systematic management of vital knowledge for the organization and its associated processes of creating, gathering, organizing, diffusion, use and exploitation of knowledge, carried out in pursuit of the objectives of the organization"[19]. Knowledge management can also be treated as a specially designed "system that helps organizations to acquire, analyse the use (re-use) of knowledge in order to make faster, smarter and better decisions, so that they can achieve a competitive advantage"[10]. In order to obtain a complete picture of knowledge management need to mention two aspects. The first talking about the fact that knowledge management is "management of information, knowledge and expertise available within the organization, i.e. the creation, collection, storage, sharing and use, to ensure the organization's future development of existing resources"[12]. Second, where knowledge management is regarded as a "deliberate business strategy, which selects, distils, stores, organizes, packs and provides information relevant to the company's business in a way that improves staff efficiency and competitiveness"[5].

As we can see, authors of the above definition also emphasizes the two items related to knowledge management. Both accessible to, the information, experience, staff and their expertise and the technological, where the focus is on codifying knowledge, its acquisition, collection, analysis, storing and sharing at any time, by a specific user. The logical also is the fact that the development of knowledge takes place through the exchange of experiences, analysis, opinion, finding new sources of information, where the information systems are the basis to allow all of the actions.

IV. KNOWLEDGE MANAGEMENT TOOLS

As mentioned earlier, knowledge management is to create added value for the company and its environment proximal and distal. Due to the ongoing intensive technological development has now become a common use of communication tools allowing the use of accumulated knowledge and its proper share respectively of all company employees. According to prevailing quality standards for functional knowledge management systems, it is desirable that the software is compatible with other environments that

utilizes the company or its partners in the supply chain. It is true that currently supplied management information systems do not focus on the separation of the component dedicated to the management of knowledge, but rather allow it to manage in the "background", without limiting in any way the access to knowledge or to give support key company processes.

Due to integrated information system, it should be understood as a modularly organized system, supporting all areas of its business, from marketing and planning and procurement, through the technical preparation of production and the control, distribution, sale, management of repair work financially - accounting and management human resources. [1]

The integrated system is a system in which data or information is entered only once, and they are available to all users of the various processes in the enterprise. The most common, the most distinguished units in integrated systems are:

- an organizational chart - taking into account the structure: vertical and horizontal - user login to the system,
- input - screen formats for data entry,
- order - the products / services - short / long-term, temporary of contractors - implementation schedules - time and value of the contracts short / long term of complaints - the frequency,
- planning - sales of short / long-term production capacity, about forecasting in demand, prices, the scheduling of purchases - material procurement automation, the distribution needs - transport, forwarding
- production / services - technological resources, location, staff, materials, semi-finished products
- staff - directory management employees, managers, employees, executive, administrative, a database of periodical co-workers,
- materials management - information on materials (eg, prices)a database of suppliers, about purchase history, the timing of purchases
- fixed assets: production by division, assets, condition of assets,
- control - of finishing orders of jobs, areas of control, the amount of control about the control points, reports,
- book sales - a record audience, issued documents: the amounts received and receivable of sales analysis, implementation plans, short / long term
- module obligations - register suppliers of necessary goods and their normal consumption of goods purchased,
- master register - maintaining the organization's financial data, simulations of possible states

- module financial - accounting - analysis of energy and raw materials, wages, load workstations of finance - budget, bank, payment procedure. [11]

Carefully selected an integrated management information system now enables efficient management of the entire organization, carrying out the functions of the enterprise environment taking into account both internal and external, and therefore, appropriate management of enterprise knowledge. "The selection of specific solutions and technologies in the field of knowledge management should be based on the specific nature of the company, its profile, personal economic situation, its strategy and approach to knowledge management. Any company or institution should be considered as characteristic for the organization of the organizational culture, creative workers, rules and norms prevailing within it and look at it from the perspective of ongoing business processes. In addition, each organization must be aware that a comprehensive knowledge management system cannot be based only on an appropriately selected technology"[19].

V. UNIVERSITY=ORGANIZATION

To be able to say that higher education institutions can be considered for the organization, in terms of management, one must start from the definition of the firm. Companies in Polish law is defined as "an organized set of tangible and intangible assets intended for business" [7]. Institution (according to management sciences), as defined by T. Pszczołowski is the "organization, which is a team of people interacting with each other and properly resourced" [17]. Continuing, J. Zieleniewski states that the term "institution" is a social creation, called. "Thing organized," which factors are creative human capital and tooling needed. [21] In the literature it is also possible to find the phenomenon, where the concept of the organization is used interchangeably with the term institution.[4] It can be concluded, that the concept of institutions is synonymous with the concept of the organization in terms of factual. Knowing that Polish universities are institutions, we can consider the above classification that should be treated as an organization that can be managed in a comprehensive manner.

Taking into account the objectives of Economy Based of Knowledge and National Development Strategy, as well as other documents and regulations speak of the need to develop and adapt to the new market situation, taking into account the assumptions of the concept of sustainable development, it can be concluded about the need to implement appropriate IT tools within the "forward-thinking organization". As colleges and universities that provide comprehensive solution of the organization, have their own resources, a strict hierarchy and organizational structure, culture, and provide specific services, they are forced to face this present demographic projections take steps to ensure the survival of a heavier period and in a short time to adapt to new trends in the

labour market, in order to refocus the education directly under the existing demand.

Knowing that every company is made up of individual stocks, processes and the environment in which it operates, it is necessary that each learning organization, have implemented an integrated information system. Information systems are nowadays an integral part of most organizations. As previously shown, information systems affect the basic structure and design of the organization. The main purpose of information systems is to satisfy all existing information needs generated by the organization in order to be able to make the right decisions for appropriate decision-making bodies.[3] It is also known that the larger the organization, the knowledge management system using the information becomes more difficult. However, due to technical capabilities, integrated management systems support mainly horizontal communication, without compromising on the priority of vertical communication. Properly designed information system should also allow for quick and easy communication with the environment of the organization, such as customers, and in the case of higher education such as students.

Why universities should have within its structure an integrated information system? The answer is very simple. Universities are being developed organization providing educational services primarily with the use of highly skilled human capital, the use of modern technologies, and other essential resources needed to carry out business activities, providing the market of people defined by psychologists as "creative". Because the university is the responsible of the obligation to seek to achieve the objectives of the KBE and the National Development Strategy, it is necessary to establish their business as a company - put an integrated information system that will not only improve operational efficiency by almost immediately verify the responsibility of individual positions, structured different levels of management, but also through better organization of business processes occurring inside and outside the university, along with the improvement of communication between internal customers and external institutions.

What is an integrated information system? It is nothing other than a comprehensive system designed to optimize business processes both inside and outside the company, using tools to automate the exchange of information between clients throughout the logistics chain. Considered as the most effective integrated information systems are Enterprise Resource Planning systems (ERP). ERP represent a group of integrated computer systems, such as modular structured enterprise information systems. They gather in one coherent system of all the traditional functions of management (related to financial and management accounting, finance, human resources and payroll, technical preparation of production and its control, procurement, warehouse management, planning and execution of sales and logistics, quality management)"[23]. Their main objective is to integrate internal and external environment of organization.

This process is supported by the latest information technology solutions, such as multidimensional data analysis in data warehouses. The modular ERP also provides comprehensive knowledge management in organization. Confirmation of this view can be found even in the same characteristic features of ERP systems:[11]

- functional complexity - covers all spheres of business activity,
- integration of data and processes - including the exchange of data and information between modules, internal organization and its environment (EDI),
- functional and structural flexibility - is designed to provide maximum adaptability, customization and hardware solutions - software to the needs of the individual modules,
- open-enables you to extend the system with another, new modules
- substantive progress - provides full support for the processes of information - decision-making using the full data extraction and aggregation, as well as practical support system for logistics strategies such as JIT, MRP II and TQM
- technological advancement - ensures compliance with current standards of hardware - the programming with the ability to migrate to new platforms,
- compliance with law such as the law on accounting.

VI. Smart University

Based on the assumptions, known in the world concepts of smart city, smart business, or even smart building, it is possible to say that colleges and universities can also get a smart domain name. Based on the assumptions of the Research Group of IBM Specialists, which attempts to outline the concept of smart institution as a smart city, where it is defined as "the integration of infrastructure: physical, social, business and IT"[9], by analogy we can try to concretize basis of smart university. Figure 1 shows five segments, which authors assume as relevant to the concept of smart.
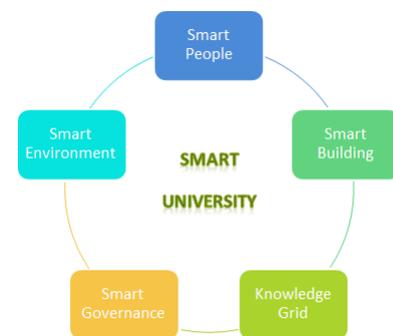

Figure 1. Components of smart university.

To be able to say that the university achieves type of smart, it must be managed in an intelligent way. It means, the authorities during making decision have to include all

five university contractual determinants: human and social capital (called smart people), available physical infrastructure (called smart building), an integrated information infrastructure (called knowledge grid), strategic decision-making processes (called smart governance) and aspects related to the protection of the environment (called smart environment). In order to manage institution according to such approach, decision-makers must consider institution as a whole, as a single organism. Therefore authorities of universities should be aware that making changes in one specified area has influence in second one. Considering such obvious mechanism it becoming needed to manage all segments of the university in a coordinated manner through the use of available information solutions enabling consolidation of knowledge and efficient management. Hence the necessity of implementation properly prepared, dedicated, fully-integrated management information system enhanced by intelligent modules, allowing to carry out a number of advanced business analytics. Computerization of communication between university-customers will help to facilitate the collection of information and improve communication between system users. In addition, the accumulation of large amounts of information, both in the form of reports, studies, statistics, or in the form of answers to questions, contribute to the development of the wisdom of the institution. Operation of university decision-making bodies in terms of sufficient information can therefore be involved in creating the best conditions for the development of the institution, as well as serve the needs of the labour market and the customers themselves universities. Improving the quality of services provided by universities can be guaranteed only taking into consideration the resource information from its environment. Therefore, it is important that the participants had the opportunity to free, independent, re-use of public resources, tools and information.

In addition, smart university should have:

- complex interaction (called comprehensive contact), including intelligent management of resources, equipment and utilities, allowing to specify the location of objects in real time using ICT infrastructure
- full integration (called fully-integrated), assuming that the basic scheme of the system infrastructure supporting university heterogeneous data are fully integrated together,
- incentive for innovation (called encouragement for innovation), covering all activities of the university intended mainly for its interior and exterior public institutions in order to spread the use of its new technology as a way to ensure the development of their own, as well as regional
- group work (called collaborative operation), based on intelligent infrastructure, critical systems and cooperating users - employees of the university, both administrative and scientific, which will help to improve the efficiency of the university.

A perfect example of higher education in Poland, which aims to provide smart can be a School of Social Sciences (pl. SWPS), based in Warsaw, together with affiliated divisions in Poznan, Wroclaw, Katowice, Sopot have deployed dedicated to the needs of the institution integrated management information system ERP SIMPLE.EDU [25]. The use of a comprehensive IT solution by School of Social Sciences allowed for more efficient management of the institution and the proper management of its resources, mainly knowledge organization.

VII. Conclusion

The discussion conducted in the pages of this article can be concluded that the company's success is conditioned by the precise knowledge management company. It also means that organizational success depends on access to high-quality information, appropriately implemented IT solutions and business culture of institutions. "Managing organization requires efficient management of knowledge and human capital, treated as assets that are purchased, maintains, develops, evaluates and monitors. To enable the organization to be fully competitive in the global and local market should meet two conditions: have adequate knowledge and be able to take advantage of their knowledge"[13]. As can be seen in the pages of this article, knowledge is a sensitive factor in determining business value.

Additionally, caring about knowledge management at every level of organization enables creating opportunities of organization growth. It allows also to implement innovation, conduct studies on the effectiveness of organization considering processes inside and outside the organization. Such strategy may improve functioning of the supply chain, in which the institution operates. Also, implementation of customized information system supporting managing allows improving communication within the organization. Ensuring integration within organization supported by a comprehensive intelligent information system management is the starting point for achieving the objectives contained in the concepts such as Sustainable Development Strategy and Knowledge-Based Economy. Meeting the objectives of computerization of enterprises, which is crucial for the use of highly skilled human capital, business management in a holistic way, where decisions to solve one problem take into account potential changes in other aspects of company is none other than the foundation of modern management concepts, where the business seeks to type named "smart".

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