

## **KNOWLEDGE MANAGEMENT IN THE INNOVATION POTENTIAL OF ENTERPRISES. A CASE STUDY OF PRACTICAL SOLUTIONS**

**Tomasz Norek**

University of Szczecin

norek@wzieu.pl

### **Abstract:**

For a long time, formalized knowledge management was in fact only reserved for large companies. Meanwhile, increase in market competition and the dynamic changes in companies' external environment in recent years have made also small and medium enterprises attach great importance to the issues of knowledge management. It is especially visible in attempts to support knowledge management in the areas which are considered core from the point of view of increasing competitiveness of the company on the market. Knowledge management in the field of company's innovative potential or in the area of the intellectual capital may serve as an example. This situation forces search for new solutions of knowledge management in the field of research and evaluation of the innovative potential of companies. Dedicated IT systems which facilitate gathering and analyzing of data describing the innovative potential of companies may be a partial solution to the aforementioned problems. The author formulated the following research hypothesis: a properly designed IT system improves the efficiency of knowledge management in the area of analysis and evaluation of innovative potential of the company. The main purpose of this article is to present an Internet platform for innovation audit, as a tool which supports knowledge management. It may be a perfect tool for creating knowledge about the company's innovativeness and it may stimulate construction of improvement in the strategy in the field of innovativeness development. The presented solution (which is based on the original IT system) is a research tool developed by the employees of the University of Szczecin.

*Keywords: knowledge management, innovation potential, benchmarking.*

## 1. INTRODUCTION

The complexity and variability of the modern economy means that the information becomes a key resource, essential for the proper functioning of any enterprise, and in the broader sense of the country and the national economy. Economic information management issues (in particular, information extraction and processing of information into knowledge) at the enterprise level, regional or national economy is an important practical problem and research. Currently, practical all areas of modern economics are grappling with the problem of information management, in both theory and practice. Economic information management is directly linked to issues of knowledge management, defined as a set of tools and methods to transform information into knowledge.

It is especially visible in attempts to support knowledge management in the areas which are considered core from the point of view of increasing competitiveness of the company on the market. Knowledge management in the field of company's innovative potential or in the area of the intellectual capital may serve as an example. This is caused primarily by the fact that the knowledge in the indicated areas is difficult to obtain. Knowledge in these areas is very often created from soft and non-quantifiable determinants. Therefore, building an effective knowledge management systems is becoming a challenge for researchers.

In the process of deliberate knowledge creation, in the area of company's innovative potential, dedicated knowledge management systems begin to play a more important role. The purpose of this article is to present an Internet platform for<sup>1</sup> innovation audit, as a tool which supports knowledge management through the use of benchmarking methodology. The presented solution (which is based on the original IT system) is a research tool developed by the employees of the Department of Innovation Effectiveness, Faculty of Management and Economics of Services, University of Szczecin. Due to the limited size, the paper will be presented only the main features of the created tool.

## 2. KNOWLEDGE MANAGEMENT SYSTEM AND THE ROLE OF IT IN ITS FUNCTIONING

The issue of knowledge management is seen as an important element of creating a competitive advantage and as a factor affecting creation of a company's value. Skillful knowledge management is indicated as one of the most progressive factors stimulating the possibility of the company's development – it is the factor which utilizes most strategic resources of any organization, namely information and information based knowledge.

Knowledge management is defined as all activities aiming at identifying, gathering, processing and making available of staff's public and hidden knowledge in order to increase the efficiency and effectiveness of the company's operations (Roa, 2004, p.23). The model describes the elements of knowledge management system was presented by J. Liebowitz. All currently functioning knowledge management systems using this model (or models with minor modifications). The classic model describing the typical and most important elements of knowledge management system is presented in picture no. 1

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<sup>1</sup> The author in the present article uses this names interchangeably: IT system (as a general identification of the described tool) and the audit platform (as a proper name of the tool).

Recently, knowledge management applies to all crucial areas of business activity, and essentially includes the following areas (Watson, 2003, p.31; Awad & Ghaziri 2007):

1. Information and access to information management (support of the management process for knowledge codified in the structured or not structured databases – that is management of public knowledge).
2. Management of the organizational process knowledge.
3. Management of the company's employees' knowledge (tacit knowledge).
4. Management of the company's knowledge integration from the internal and external systems.
5. Intellectual capital management (supporting the process of generating value from intellectual assets available in the company).

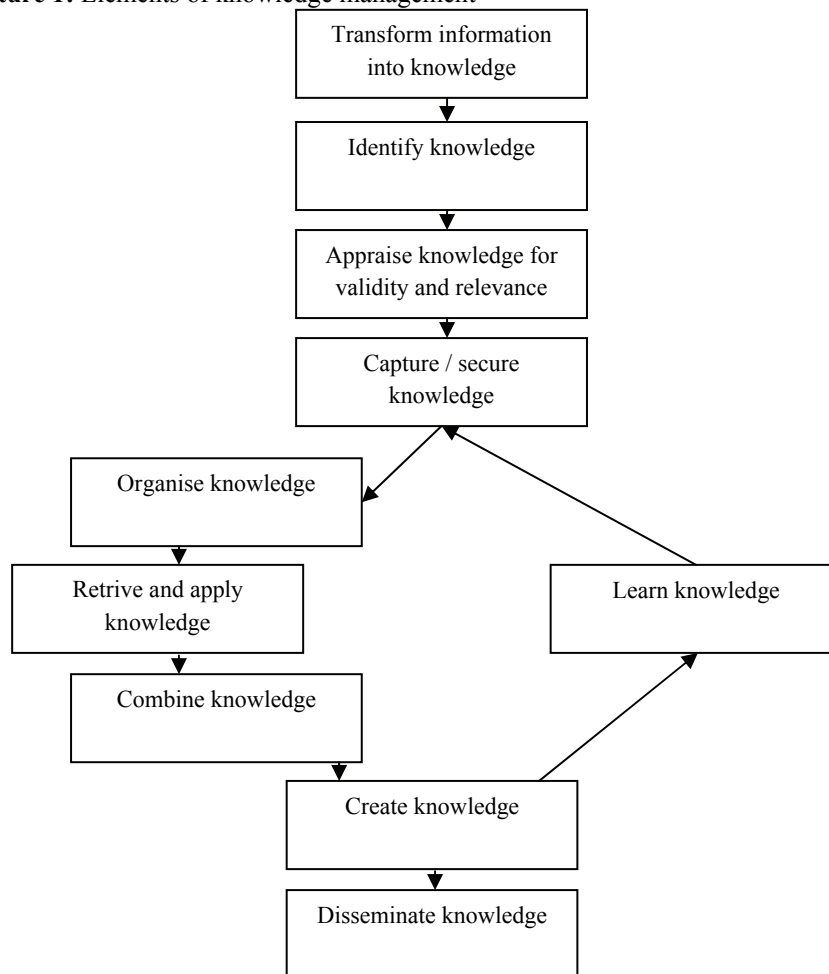
The debate concerning the issues of knowledge management equally focuses on the methods and techniques of gathering knowledge and on technical measures utilized in this process<sup>2</sup>.

Analysis of the literature and practical solutions to the described scope, shows that from the perspective of knowledge management, benchmarking is an excellent source of information. The main advantage of this method is the ability to measure and compare the size of both quantitative and qualitative. These features allow benchmarking to better understand the processes occurring inside the companies as an effective creation of knowledge about these processes. The knowledge created in the process of benchmarking can be used in practice to improve the competitiveness of enterprises (usually by improving the quality of products and services and reorganization of business structures). And in the long term, thanks to the possibility of identifying best practices, knowledge created in the process of benchmarking can contribute to a precise strategy of enterprises.

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<sup>2</sup> See. Harvard Review Business (2006), Knowledge Management, OnePress, Warsaw.

**Picture 1:** Elements of knowledge management



Source: Lebowitz, 2000.

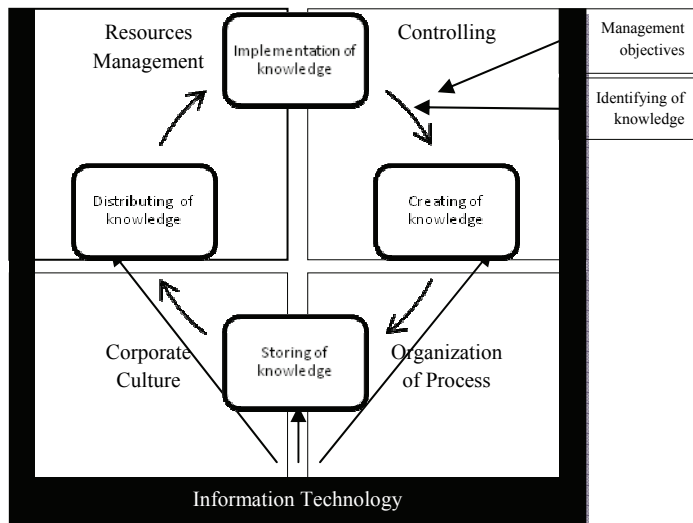
Importance and significance of the modern knowledge management supporting tools is particularly emphasized in the so-called Japanese knowledge management model (SECI), created by I. Nonaka and H. Takeuchi (Nonaka & Takeuchi, 1995, p. 69). In recent years, a number of models illustrating development and operation principles of the knowledge management system in a company have been created. Published models present interactions of the knowledge management system with the business processes taking place in a company.

In the model proposed by G. Probst, S Rauba and K. Romhardt the following stages of knowledge management have been distinguished (Probst, Rauba & Romhardt, 2002, p. 119):

- knowledge locating,
- knowledge acquisition,
- knowledge development,
- knowledge sharing and knowledge distribution,
- knowledge usage,
- knowledge preservation.

Analysis of this model indicates the necessity of connecting the knowledge management system with the information system of the company. It is especially visible in the areas of knowledge distribution, processing and storing. Connections between the knowledge management system in a company and the IT systems are presented schematically on picture no. 2.

**Picture 2:** Significance of IT systems in knowledge management



For a long time, formalized knowledge management was in fact only reserved for large companies. Meanwhile, increase in market competition and the dynamic changes in companies' external environment in recent years have made also small and medium enterprises attach great importance to the issues of knowledge management. It is especially visible in attempts to support knowledge management in the areas which are considered core from the point of view of increasing competitiveness of the company on the market (Chan 2009). Knowledge management in the field of company's innovative potential or in the area of the intellectual capital may serve as an example.

### **3. SUPPORTING KNOWLEDGE MANAGEMENT IN THE AREA OF INNOVATION POTENTIAL BASED ON THE IT SYSTEMS**

In the process of deliberate knowledge creation, in the area of company's innovative potential, dedicated information systems begin to play a more important role. IT tools allow efficient gathering of data related to the evaluation of the innovative processes, and they provide an advanced tool which allows detailed and in-depth analysis of different aspects of stages of the innovative process from the point of view of the company. In addition, thanks to gathered data, such systems enable a number of benchmarking comparisons to be conducted, which may become the basis for formulating the strategy concerning development directions for innovativeness. Knowledge management in the area of innovative potential is not only a problem of lack of effective support tools. It is also the problem of obtaining adequate data to describe accurately the main determinants of innovation.

Existing monitoring systems - eg. EUROSTAT - collect only the selected (primary) data describing the innovation of enterprises. Data collected in this way give some overall picture of the potential of innovative enterprises in the region and do not allow for detailed analysis. Obviously, different monitoring systems are created for innovation - especially in the implementation of projects aimed at supporting the development of regional innovation. The problem is their impermanence-monitoring systems typically stop working (or not developed further) after completion of the projects.

At the same time, it can be indicated that the large companies have already noticed this problem long time ago and systematically modify their IT infrastructure in order to obtain as high analytical knowledge management effectiveness in the above designated areas as possible (Pralhalda & Krishnan, 2008, p. 31).

Meanwhile, companies of the SME sector do not have at their disposal any dedicated tools which directly support the knowledge management in the area of the company's innovative potential. Knowledge management in the companies of the SME sector is usually based on the commonly available IT solutions which very often do not provide sufficient efficiency.

Situation described above forces search for new solutions of knowledge management in the field of research and evaluation of the innovative potential of companies. Dedicated IT systems which facilitate gathering and analyzing of data describing the innovative potential of companies may be a partial solution to the aforementioned problems ([Falbo, Arantes & Natali, 2004; Zanjani, Rouzbehani & Dabbagh, 2008).

An audit of the company's innovative potential based on modern IT solutions may be an example of such a dedicated IT system. It may be a perfect tool for creating knowledge about the company's innovativeness and it may stimulate construction and improvement in the strategy in the field of innovativeness development.

#### **4. INNOVATION AUDIT PLATFORM AS AN IT TOOL SUPPORTING KNOWLEDGE MANAGEMENT**

At the beginning of 2009, at the Faculty of Management and Economics of Services at the University of Szczecin attempts were made to create an IT system for supporting knowledge management in the field of analysis and evaluation of a company's innovative potential.

The author of the publication formulated the following research hypothesis:

*A properly designed IT system improves the efficiency of knowledge management in the area of analysis and evaluation of innovative potential of the company.*

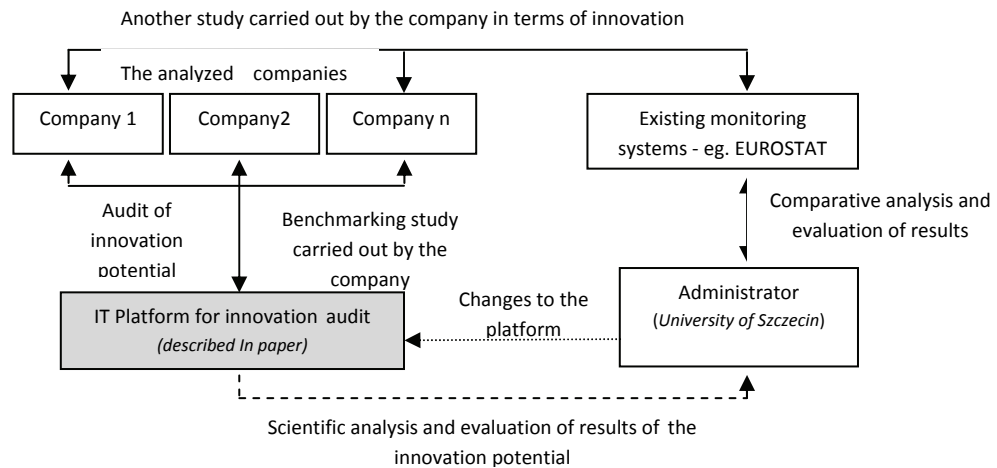
The main research goal was to design and implement knowledge management tools to assist in the analysis and evaluation of innovative potential of the company. Execution of research required to carry out the following activities:

1. Analysis of the innovation process implemented in the enterprise.
2. Preparation of specification and design for knowledge management system.
3. Make the implementation of the system.
4. A research of the innovative potential of enterprises using created knowledge management system.
5. The evaluation of the results.

The basic research goal has been achieved based on the logical induction method basing on the analysis of the innovative abilities measurement of the small and medium businesses sector companies, the detailed analysis of the innovative process implemented in a company. The research includes all the key internal determinants influencing the company's ability to implement the efficient innovative activity. In pursuing the study used a benchmarking method, which helped to make comparative analyzes. The research was conducted according to the model presented in Picture No. 3.

The system which was being created was expected to be dedicated for small and medium enterprises. In assumption, the designed system, created in the form of an audit platform, was expected to be an easy to use, flexible and effective tool, which would support entrepreneurs in the process of gathering and analyzing data concerning crucial areas of the company's innovative policy. Additionally, the created system was supposed to allow benchmarking comparisons to be conducted of the obtained results, with the other data registered in the system.

**Picture 3:** Research model



The platform was activated on the server of the Faculty of Management and Economics of Services on May 1st 2009. The system design was made using object oriented Coad - Yourdon methodology. The physical implementation of the system was completed using PHP 5.0 and AJAX technology. For implementing the physical layer, MySQL relational database management system was used. These technologies were selected as they were regarded as ensuring stability of the created solution. This choice also facilitates further works related to system development<sup>4</sup>.

Call for testing (using the platform) was sent to 5 000 companies in the West Pomeranian region. The only restriction for participation in the study was the size of the company - the survey was directed only to the SME sector.

Each entrepreneur interested in carrying out an innovation audit may register their company in the system and, after activating the account, can enter data describing the company – these data will be further used to implement the benchmarking comparisons. It is important to notice that for comparisons only general data are used, which does not clearly identify a company - it ensures the anonymity of the users of the audit platform. The user who will supplement data which allows performing comparative researches, may proceed to the research survey.

The structure of an innovation audit corresponds with an analysis of subsequent phases of the innovative project's implementation process, starting from the analysis of the situation and environment of the subject, through competent searching for new ideas, accurate estimation of

<sup>3</sup> The presented audit platform is available on the website [www.ai.wzieu.pl](http://www.ai.wzieu.pl).

<sup>4</sup> Detailed technical description of functioning of the audit platform can be found on the site [www.ai.wzieu.pl](http://www.ai.wzieu.pl).

future results, obtaining sources of financing, to an effective and efficient implementation of initiatives along with necessary control of their products and results.

Course of the innovation process in an organization, based on the adopted strategy of innovativeness, requires continuous, reliable analysis, whose results will provide reliable source for making effective business decisions. It may include identification of organization's problems, development of ideas, creation of programs and projects in a area of innovations, conducting research and development and improving particular phases of the courses of process in an organization and products, and evaluation of acceptance of new solutions by clients and other stakeholders.

Innovation audit process is conducted using the research survey containing 43 questions (in the basic version – number of questions and their importance may be shaped by a research administrator, in a form of the designed research paths, which are automatically selected by the system on the basis of a company's features). The questions are divided into eight categories – which corresponds to the stages of the innovative process in the company:

1. analysis of the situation inside and outside the company,
2. problem of seeking ideas for innovation,
3. the issue of planning projects in the field of innovation,
4. financing of innovative projects,
5. culture of innovation and human resources development strategy,
6. internal communication within the company and its organization,
7. the issue of diffusion of innovation and commercialization,
8. the issue of implementation of innovative projects.

Such research methodology is consistent with the path of implementation of the innovative process, universally described in the subject literature (Vahs & Burmester, 2003, p. 144).

Detailed methodology of researching innovative potential was prepared at the University of Hamburg (Universität Hamburg).

Filling the survey automatically generates a report which evaluates the research, along with anonymous comparison of a company's condition to other subjects in accordance with the selected criteria of the background comparison.

System was equipped with a module RESEARCH CREATOR which enables the person administrating the audit platform to virtually freely shape the research survey: adding, editing or removing questions asked during the audit, and creating the research paths, according to the assumptions developed during creating the research methodology.

Each research can be interrupted at any time – then it receives a status which enables free editing of the results. Upon recognizing by the user that the research has been completed, research receives status which prevents editing, and system prepares the research report in PDF format which may be downloaded by the user at any time. The user may carry out any number of researches (surveys) in any time intervals. Such functionality of the system enables precise evaluation of dynamics and changes of directions of a company's innovation. It also allows to gather knowledge databases, which show the condition of crucial areas affecting a company's innovation in particular registered periods.



The obtained results of the research survey (results of the last research) may be compared with any selected group of companies – which were registered in the system and which provided their data in order to conduct comparative research. As the criteria for implementing the benchmarking comparison, the user can, among others things, use the characteristics describing companies registered in the database: industries, activity area, turnover, size of the employment, activity period (defined in years).

Such selection of criteria enables comparing a company with virtually any indicated market segment – the system returns information with how many companies the comparison was conducted.

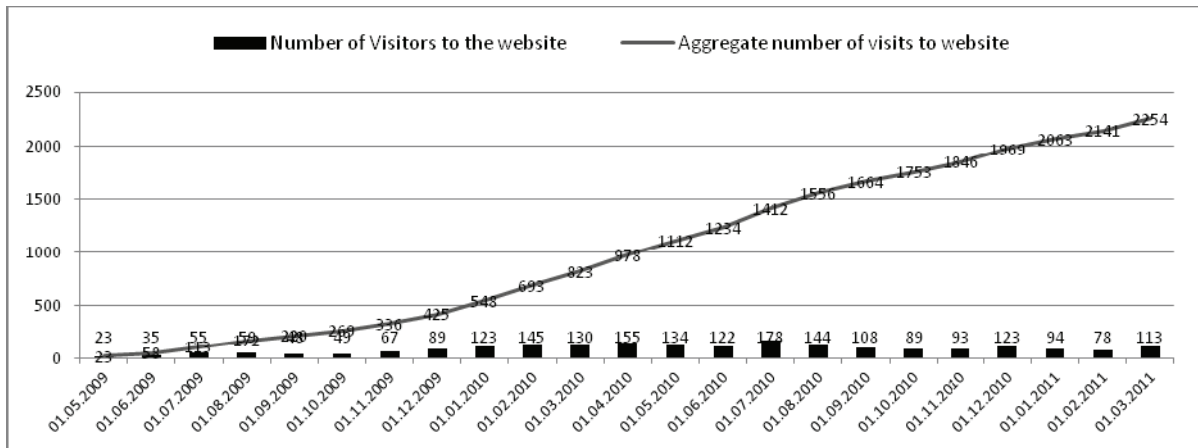
Registered user may conduct any number of the benchmarking comparisons (freely selecting the comparison criteria), while results of each completed comparison are presented in the form of report (report in PDF format can be downloaded by the user right after conducting the comparison) containing both mark in points of each of the examined innovative policy business areas of the company and ranking summary of company's position in the particular examined areas. The report also contains collective graphic presentation of the received results.

Assessment of the audit uses evaluation algorithm based on a weighted comparison of the particular categories of evaluation of innovation with other surveyed subjects. Obtained result for a company is compared in relation to:

- leaders of innovation, namely average 10 % of the subjects which obtained the best results within an analyzed areas;
- conservatives, namely average 10 % of the examined companies which have obtained the weakest results;
- an average result obtained by examined companies.

At the moment, (as for 15. 4. 2012 ) 332 companies were registered in the system (innovation audit of the registered companies was made). Registered companies performed 542 audits (number of the audits is greater than number of the companies registered in system – it results from nature of the system: companies perform subsequent multiple audits, which allow them to evaluate changes in an observed areas through time). Companies registered the in system performed more than two thousands comparisons with other companies (groups of companies) registered in the system. One should also point out that the audit platform website was visited more than 2200 times, which confirms great interest of entrepreneurs in the created system.

**Picture 4:** Statistics of the audit platform website entrances



Source: own elaboration based on the statistics of the server [www.ai.wzieu.pl](http://www.ai.wzieu.pl).

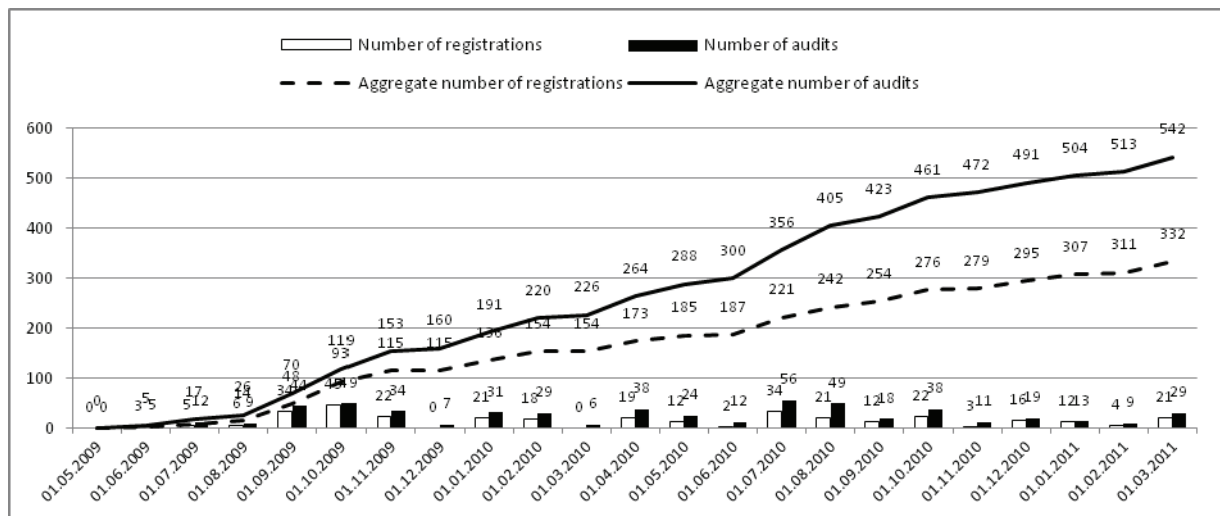
Statistics of the audit platform website entrances in the period from May 1st 2009 to July 1st 2011 has been presented in detail on picture no. 4.

Registered data allowed users of the system (enterprises) to make precise evaluations of company's innovative process potential, to analyze company's position in comparison to selected segments of companies, and, at the same time, to evaluate competitive position, in the field of innovation or eventually to evaluate the dynamics of changes of the innovative potential over time. This data provides valuable knowledge to companies concerning formulation of a strategy of activity with regard to creating a company's innovative potential and competitive position. Statistics of the number of registered users and statistics of the conducted surveys in the period from May 1st 2009 to July 1st 2011 have been presented in detail on picture no. 5.

Data registered in the system made it possible for employees of the Faculty of Management and Economics of Services to conduct a number of researches and analysis related to assessment of company's innovative potential at the regional level<sup>5</sup>.

<sup>5</sup> The report on pilot survey of the innovative potential of companies in the West Pomeranian Province which was conducted using the described audit platform can be found on the site [www.ai.wzieu.pl](http://www.ai.wzieu.pl): P.Niedzielski, W. Downar, M. Skweres Kuchta, Innovative Audit (Audyt Innowacyjności), Report on pilot survey, Szczecin 2010. In addition, data obtained via the platform have been utilized in a number of scientific publications, see. T. Norek The impact of the Innovative Potential of Polish SME Companies on their Innovative Activity Realization Models, GSTF Busiess Review Vol. 1 No. 4.

**Picture 5:** Statistics of users registration in the system and statistics of the conducted innovation audits



Source: own elaboration based on the statistics of the server [www.ai.wzieu.pl](http://www.ai.wzieu.pl).

The size structure of enterprises registered in the system is as follows: micro 71 %, small 26 %, average 3 %, and business activity structure is: 71 % services, 29 % production. This structure confirms the need for management expertise in the innovative potential especially in micro and small enterprises. This is probably due to the fact that micro and small enterprises often do not have the tools to efficiently acquire and manage knowledge in the described area. Also draws attention to the fact that companies operating a service, often used the platform. This is because on the one hand the structure of the West region's economy, on the other hand, we can assume that it is the services sector companies seeking information about the possibility of more intensive management of knowledge in the field of innovation potential.

A large interest in the platform stimulates employees of the Department of Management and Economics of Services to continue research and development works related to the system. Some of the planned changes and implementations of the system's subsequent modules are own ideas of the department's employees, some are a response to comments and suggestions reported by current users of the platform.

At the present time, works related to developing a graphic presentation module of the gathered data are in progress – the system will present predefined indicators describing innovative potential of a region in a tabular form and in a form of graphs. Users of the system will also be allowed to create their own sets of indicators and subject them to observations.

Another planned step related to extension of the described audit platform is the system of monitoring and notifying users automatically of changes in the area of crucial indicators. This module will – according to the user's definition – monitor defined groups of indicators and in case of changes (threshold value of change which the system will react to will also be defined by user) it will notify the user of the platform.

In the future, authors also plan implementation of a module presenting gathered data on maps, – this will enable effective and transparent analysis and evaluation of a company's innovative potential in a geographic perspective.

## 5. CONCLUSION

First researches completed by the presented system indicate that this is a very effective tool, which have a significant impact on supporting knowledge management in the field of gathering and processing information concerning crucial areas, which create innovative potential, and conduct precise evaluations of the company operations. An additional positive aspect of the created system is that it supports scientific research in the field of companies' innovation.

The most important advantages of the presented tool include:

- availability of the system (it is available through WWW site and can be accessed by any web browser);
- simplicity and ergonomics of operation,
- availability of the mechanism allowing to evaluate dynamics and changes of the directions of innovation in a company - audit can be performed periodically (at any time intervals – depending only on needs of a company using the system);
- availability of the mechanism allowing conducting benchmarking comparisons with other entities registered in the system.

An additional advantage of is the fact that innovativeness of a company may be perceived differently, depending on the responding entity (subjectivity of opinions) - thus, the tool allows to confront various positions and opinions on the development of the company's innovativeness, which may positively affect the shaping of the company's innovation strategy.

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