Innovation Management: The Need of a Model for Manufacturing Micro - Enterprises

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ABSTRACT

Purpose: Innovation is an important element in enterprise productivity. This study aims to carry out a conceptual analysis on the role of the process of innovation management in the development of manufacturing microenterprises in general.

Methodology/Approach: We analyse the main models that exist today, their main components and the possibility of being adapted to the small size of the Micro Small and Medium Enterprises (MSMEs) which contributes to achieve the development and adoption of an innovative culture under the current conditions of this productive sector in Ecuador.

Findings: We identified the complexity of applying innovation management models to any type of company because these models are not multifunctional and there are restrictions for their application.

Research Limitation/implication: The current models of innovation management are not adapted to the characteristics and size of the microenterprises, which becomes into difficulties to bring about fundamental changes in the areas of innovation, intuition or inspiration, and, it is necessary to take actions in this regard.

Originality/Value of paper: This document is based on the literature review of the process of innovation management. Through this analysis, the authors detected that the smaller companies have more difficulties to carry out innovations than the larger ones.

Category: Literature Review

Keywords: innovation; management; model; microenterprise

1 INTRODUCTION

"Management implies the ability to operate on key dimensions of different systems and processes, modifying their states and their directions" (Albomaz and Fernández, 1997), with a clear intention: to generate, rescue, analyse, mature and take advantage of those ideas, which could constitute innovations and obtain a favourable margin of competitiveness for the actors involved.

From this perspective, this concept of management, applied to innovation, needs to be clarified on its meaning, for which, these management activities have been classified into three types: sporadic, intermittent and systemic (Morales, 2002).

Therefore, the concepts of management and innovation are closely related. (OECD and European Communities, 2005) in the Oslo Manual suggests that innovation is "the introduction of a new, or significantly improved, product (good or service), process, new marketing method or a new organizational method, in the internal practices of the company, the organization of the workplace or external relations". All of which is associated with the management definition of previously stated, and it denotes an interest of paradigm change in the action (Albomaz and Fernández, 1997).

Innovation is a key tool for organizations seeking to become world class or excellence leaders (Parada, 2012).

The management of innovation can lead to failure, so it is imperative to assess the risk involved (Baena, et al., 2009). Defined methodologies and strategies must be established in order to be able to innovate, as well as using tools to study the factors involved in the innovation process and detecting the opportunities and threats that exist in the different scenarios.

Innovation Management (IM) is, therefore, according to these authors, a principle or approach to management completely voluntary. It is not ruled by legislation, but its implementation can be structured through standards and non-binding models, that is to say, voluntary models.

Although there are no established formulas for the process of innovation, it is useful to consider necessary certain principles, to generate innovations from organizations such as stimulating disruptive thinking, acting with knowledge of the sources of innovation, performing technological surveillance, approaching to problems in an interdisciplinary way, generating spin-offs and creating networks to promote partnership.

In developed countries (DC) there is a large amount of data and empirical studies that show the innovative activities developed by firms and the adequate estimates of the results, thanks to those activities. It confirms the existence of the link between technological innovation and competitive performance - this is not the case of Latin America, where there are deep questions about the characteristics and scope of technological change processes.

In Ecuador, MSMEs constitute an important sector of the economy. In 2014 there were 91,066 of them, 80% higher than 2009 (INEC, 2016a) and on average they generate 60% of employment (Quiñonez, 2012).

Although there are many limitations to the management of innovation in SMEs today, a number of innovation management models have been developed for SMEs, and they cannot be adjusted to MSMEs because of their size, which increases the gap in their technological development.

The development of this sector demands science and innovation to raise the effectiveness of the business system. Hence, the need for a model that fits the characteristics of these companies, so that it can link scientific results, not only to implement them but also to allow a flow of business criteria that favour feedback for innovation adequacy.

This paper considers the theoretical bases of innovation management for micro-enterprises in the manufacturing sector, specifically the food sector in Ecuador.

2 CONCEPTUAL ANALYSIS ON INNOVATION MANAGEMENT PROCESS AND INNOVATION MANAGEMENT MODELS

2.1 Management of Innovation

Álvarez (2015) quoting Ospina (1993), and Ortiz and Pedroza (2006) mention that the concept of management arises to refer to a more audacious and heterodox way of managing with a more aggressive orientation than administration itself focused on the action and the creative solution of the administration problems within a context of innovation.

Faloh (2006) states that the new management paradigm, understood or not, means a phenomenon of innovation, not a process or product innovation, but a social innovation, and as such, it exercises its influence at all levels, going through the organizations and reaching the people who are part of it.

In a world where human needs are increasingly sophisticated and even complex, innovation has become the central element in the growth and development of societies and, with them, organizations understood as social entities oriented towards the fulfilment of objectives and designed as active systems (Sheperd, et al., 2012), deliberately structured and coordinated, linked to the external environment (Daft, Murphy and Willmott, 2010).

Thus, when talking about innovation, it means having a culture of opening to changes in the company (Marulanda, López and López, 2016), that is, that the members of the organization are willing to accept the adoption of innovation (Ayala, 2014). This happens because innovation is an eminently human mental process that underlies beyond the genetic condition and the cultural profile of people. Innovation is, therefore, an issue closely linked to the management of knowledge (Peña, 2003).

Perhaps one of the most correct definitions is that of Schumpeter, for whom "innovation not only consists in new products and processes but also in new forms of organization, new markets and new sources of raw materials" (Berry and Taggart, 1994). Success in innovation is one of the main sources for companies to maintain and expand their markets.

For Huber (2001) successful IM begins when an inventive solution solves a market problem in the context of a company's strategy. The solution must be inventive because otherwise, competitors will copy it easily and quickly and so the competitive advantage will be lost.

From this perspective, the IM refers to a different way of achieving organizational synergy based on a planned change, on the use of human capital and the generation of organizational knowledge in favour of innovation, and it is shown as the result of four processes: knowledge creation, knowledge absorption, knowledge integration and knowledge reconfiguration (Bravo and Herrera, 2009).

Therefore, competitiveness is achieved through innovation. Each organization must adapt the process to its own possibilities of development and integration of knowledge, that is, to its own capacity for innovation (Bravo and Herrera, 2009), representing a path through which knowledge is transferred and becomes a process, a product or a service that incorporates new advantages for the market or for the society (Flormichella, 2005).

Organizations are based on the structured exchange of knowledge (individual and group) to respond to different problems, needs and claims of their stakeholders (Fernández, et al., 2017) and, therefore, it is not easy to speak of a unique model of innovation management in companies.

This implies emphasizing the importance of establishing reliable and durable communication channels both within the firm and with external agents (suppliers, clients, competitors, universities, research institutes, etc.) (Orjuela, 2011).

Likewise, the diffusion of innovations between the economic agents and the feedback that it provides, allows to improve the original innovation and increase the number of potential users. From this point of view, it can be said that isolation clearly conspires against the competitive development of firms, especially in relation to the innovation and organization of the productive process (Gómez, et al., 2016).

For that reason, innovation is considered today as one of the most important resources for the development of economies, creating new technologies and knowledge. It improves existing products and processes, adopts them from other economic units or creates new goods and services.

2.2 Models of Innovation Management

For Miller and Morris (1999), who consider there are four generations of innovation, the first focuses on existing needs and is based on the knowledge possessed; the second is addressed through questions to the future needs of consumers and the new knowledge required; the third focuses on the development of technology portfolios linked to business and products for existing markets.

The ability to develop continuous and discontinuous innovation is called fourth-generation research and development, based on knowledge, experiences and their implementation in different scenarios where technology has the function of support.

The effective innovation management of this generation requires a process that includes the context where it takes place, which is made up by the development of the market and the ability of the organization to respond. This competitive architecture defines the broader panorama of the organization of the market in which it competes, its customers, needs and demands, types of satisfiers, competing organizations, products in offer, characteristics, etc. (Tukker and Tischner, 2017).

The organization's ability to respond to these needs and demands is given by strategies, technology, processes, systems and tools, research and development of products and / or services where knowledge is applied, acquired and created.

Miller and Morris (1999) propose an innovation process that consists of four phases:

- Phase 1: It is the transformation of the initial idea into the conceptual definition of the application family;
- Phase 2: The improvement community takes responsibility for the project;
- Phase 3: Development of new products, services, families of distribution and development of methods;
- Phase 4: Development of market activities for a product family.

Another model of innovation is the one proposed by Utterback (2001), which has an engineering focus where technological and economic factors determine the viability of innovation. It proposes a model for the innovation process that consists of six stages: 1: Initiation of the process; 2: Formulation of the idea; 3: Formulation of the problem; 4: Problem solution; 5: Improvement and development; and 6: Use and diffusion.

The innovation process proposed by Utterback (2001) coincides with the one suggested by Miller and Morris. Regardless of the number of phases and stages that each one describes, three important moments are recognized in the process: firstly, need or idea is identified to be developed, and then the idea is developed and finally implemented and spread. All three moments require knowledge to be carried out.

According to Kim and Mauborgne (2004), if companies aspire to be successful with their innovations, they have to be based on three fundamental criteria: Utility for the buyer (is there a compelling reason to buy the product or the service offered?), strategic price (is it attractive, does it generate demand?), and a solid cost structure (can the company make money from its business model?). At the same time, they must prepare to overcome three possible obstacles:

- Employees, who might reject a new concept if it is seen as a threat to the availability of resources or change the power structures in the company.
- Consumers, who may not adopt a new idea because they do not understand its benefits or lack the necessary support infrastructure.
- Society, which will turn its back on innovation if it does not clearly understand the proposal or fears its consequences.

Gutiérrez and Núñez (2007) affirm that: "When companies face decisions that imply growing or innovating, leaders have to cope with the following dilemma: either to take advantage of their positive vision of opportunity and act as entrepreneurs, or to value risks and costs involved in this decision for short-term results, acting as financial directors." It is therefore, of particular importance to establish an ad hoc innovation management model for the needs of organizations, since there are several examples oriented to different types of organizations. It is also necessary to initiate actions aimed at making effective decisions for the dissemination of the new innovative culture.

It is complex to think of the existence of a multifunctional innovation management model; that is, that it could be applied without restrictions to any type of organization: public, social or private; micro, small, medium or large; service or manufacturing; family or corporate, and so on.

3 INNOVATION MANAGEMENT IN SMALL AND MEDIUM ENTERPRISES IN THE INTERNATIONAL CONTEXT

Not all companies have a performance and / or culture of innovation that allow them to respond to the changing needs of the market. MSMEs have structural characteristics that place them at a relative disadvantage to local and global competition, facing obstacles such as technological conversion (Vázquez, 2016).

At present, global trends in the business sector recognize a fundamental segment of the economy in small and medium-sized enterprises (SMEs and MSMEs), which generates an adequate income factor for the regions (Orozco, et al., 2015). In this context, it is necessary to stimulate change and permanent innovation, at a speed that follows the dynamics of the variable market.

Therefore, SMEs have the challenge of recognizing that in today's market, for companies to be competitive, change is necessary, and consequently innovation must be permanent. More innovation is required in the management of the company, so that in order to survive and advance, SMEs are forced to respond quickly to innovation, or what is best to a culture of transformation.

In that regard, innovation is assumed as the way to convert ideas and knowledge into new products or improving the existing ones, which the market recognizes and values. Innovation implies a desire for a transformation that allows it to be more competitive. In any case, the ability to innovate in all scenarios ensures the survival of companies and in this particular case of SMEs, since the current global trends in the business sector recognize in small and medium enterprises (SMEs and MSMEs), a vital part of the economy of any country.

Therefore, regional advances and the arrival of imported products, force the SMEs to be in a permanent process of professionalization of their management and technological modernization to increase productivity and a strategic redefinition of the business, to put themselves in a specific market place.

MSMEs must take on the change and internalize the new paradigms, to reach a new way of thinking and acting. Thus, the ability to innovate in all spheres of business will ensure, at least, the survival of the organization, a non-sufficient condition in the current scenarios.

The industrial environment that currently characterizes the developed countries is fostering a strong concentration in the development or improvement of new products, and the challenge of the MSMEs specifically contributes to consider the global nature of their markets and the need to face the existing competitiveness (Hidalgo, León and Pavón, 2000).

It is important that companies dedicate greater efforts to innovation that allows them to increase or simply maintain their competitiveness. There are several factors and trends that increase this competitive pressure, such as the globalization of markets, the emergence of new competitors or the rapid evolution of technologies.

As a result, companies cannot remain static, but must focus their efforts on continuously improving and renewing their products, services and processes to compete adequately in markets that are increasingly demanding and dynamic; in other words, innovation becomes a mandatory requirement not only for growth but also for business survival.

It is, therefore, necessary for companies to accept the challenge of innovation, which means that they must:

- Innovate frequently and effectively;
- See innovation as a way of being and acting, not an exception nor an activity that interferes with the proper functioning of the company.

From this perspective, it is necessary to recognize that a significant effort in product innovation (Valencia, 2015) has been taking place at the regional level, for some years, with some notable advances but with deficiencies that are becoming difficult to solve.

4 INNOVATION MANAGEMENT PROCESS IN ECUADOR

The presence of SMEs in the composition of the industrial fabric is prominent worldwide. This is evidenced with the support of the figures presented by (Fernández, 2005), in Europe; SMEs constitute 77% of companies; in Germany, 99% of companies.

In 1993, in the present European Union, EU (formerly European Economic Community) there were 17 million SMEs; in the United States of America (USA), SMEs made up 95% of companies. As for Asia, Japan, they are made up of 99% of companies. Regarding Latin America, SMEs are 99% in Mexico; in Argentina they correspond to 26.8% and in Mipymes 71.7%; in Colombia they are 56.2% and MSMEs 30.9%, according to data provided by the Productive Development and Business Division of ECLAC, on the official figures of each country (ECLAC, 2010).

This shows the high representation of SMEs in the economy of the nations, which is recognized into a social and economic relevance, since these companies contribute to the economy of the country, inserted into decisive sectors that generate high levels of occupation of the labour force. Likewise, they are contributors of exports, and investments by their incidence in the Gross Domestic Product per person (GDP/p).

In Ecuador, the consumption of food is of massive nature and the industry dedicated to the elaboration of food has a particular relevance within the national economic production and performance.

According to Garzón, et al. (2016), the value added of the manufacturing industry, excluding oil refining, remained in the period 2012-2016, above 11% of the Gross Domestic Product (GDP), with a participation of 4,67% of the food and beverages industry in 2016 (CFN, 2016).

An important aspect to consider is that the food and beverage sector is a significant source of employment, if it is taken into consideration that in 2016 the employed personnel index grew by 5.5% compared to 2015 (INEC, 2016b).

In addition, the importance of the sector not only comes from the supply but also the consumption of food and non-alcoholic beverages is massive and within the structure of expenditure of households, it is the largest contributor. Therefore, it constitutes the fourth part of the increment of the consumer price index (CPI) basket, being the division with the highest share in inflation all along history (INEC, 2014).

All this activity gives rise to the impulse of a variety of businesses, among them micro-enterprises dedicated to the food sector, but in general these types of companies, have government support programs, but they have not been sufficient to generate significant changes that are oriented towards the adoption of an innovative culture and usually do not have a timely reach. Taking into consideration a particular case, it can be mentioned that as a tool for the promotion and development of SMEs, the National System to Support Entrepreneurship, EmprendEcuador, was created for SMEs that are already in the mature stage.

InnovaEcuador has been created as the mechanism for companies to have the opportunity to generate products based on new knowledge (innovations), to access other markets, improve their productivity and improve their exportable offer. It also favours the achievement of funds for the development of MSMEs, products offered by this same ministry as Exportapyme, which is a co-financing component of the Fondepyme Program (Fondepyme, 2013).

In this context, the MSMEs are underdeveloped in terms of generating new ideas, since technological innovations have always been at the origin of the changes in production processes. The incorporation of new techniques presumes changes in the production systems, which bring productivity increases and costs reductions, which, in turn, have a favourable impact on the demand commission. In this regard, the incorporation of new technologies allows improvements in transportation and communication systems, as well as higher levels of quality and variety in the supply of products and services (Albuquerque, 2004).

Smaller companies generally have fewer resources and are often lacking a specialized research and development (R&D) department. They are finding it more difficult to carry out radical innovations on a continuous basis than larger companies, which have more resources, although there are some exceptions depending on the sector. In addition, the small size of the Mype companies does not allow them to take advantage of the big scale economies enjoyed by larger companies (Thom and Muller, 2013). Of course, the sphere of action of a company may differ greatly from one to another and thus foster different needs for innovation.

In spite of these multiple development programs for Ecuadorian enterprises, the progress made in this vital area for the development, expansion and permanence in the micro-enterprise market is still scarce in relation to the management of innovation.

Therefore, it is necessary to continue supporting, with better mechanisms, the promotion of innovation in Ecuadorian companies as an alternative to increasing competitiveness, as well as to continue inquiring about the subject of innovation. Hence, it is necessary to carry out a study of the models that contribute with the innovative production of the MSMEs in the food sector, taking as reference the following question: Which are the models that influence the innovation of products in the food sector MSMEs?

Thus, when talking about the models that influence product innovation in SMEs, it will be possible to identify which of them are adequate to the requirements of MSMEs to design future scenarios for their development; that is to say, to design strategies in order to increase the innovation in products and then improve the business competitiveness of these companies.

It is evident that at the beginning of the 21st century, SMEs face new challenges, as the quality, speed and agility of their work, which nevertheless, will not be enough attributes to compete successfully. Then it becomes necessary to develop new skills, disregarding certain things and learning others.

This argument deserves to have a discourse where the positions really change the prevailing conceptions and allow the new manager to adapt, with the highest capacity of response and in intellectual conditions to think beyond the unimaginable (Ludovic, 1995; Castillo and Leal, 2010). The current scenarios are precise to leave behind old paradigms that hinder the ability to think, act, and learn new experiences, which translates into difficulties to bring about fundamental changes in the areas of innovation, intuition or inspiration.

5 CONCLUSIONS

The IM process for the micro-enterprise sector should be focused on their sustainability, being flexible, and adjusting to the size of these companies, creating new opportunities for expansion and growth. Under this premise, it is necessary that decision-makers at the national level become aware of the main obstacles that influence on the efficient development of this type of company.

In Ecuador, there are strengths that can allow an effective management of innovation in this type of companies that at present, constitute an important sector of their economy. These include:

- Universities that generate inventions for the business sector, which can be adaptable to the size of micro-enterprises.
- Current policies in the country that recognize the role of innovation and technological management for the country's development.

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REMONA Model for Improving Quality of Corporate Informatics Performance Management: How to Cut Cots in Corporate Informatics

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ABSTRACT

Purpose: This paper studies the introduction or increasing of the ability to manage performance in an organization environment. The paper's objective is to facilitate the solution of this problem. Its main goal, meanwhile, is to present the REMONA model and the results of its implementation and to spark professional discussion of the concept behind it.

Methodology/Approach: A model will be created to demonstrate the use of the created artifacts within two sub-areas in the environment of two international companies (a consulting firm and an automotive firm) while using the proposed methodology. The model and the methodology will be evaluated for their creation in an organization environment and communication in the entire area.

Findings: Pilot implementation was performed at two companies. It was proven that the proposed REMONA model makes it easier to process and analyze certain financial tasks that are presently considered crucial. The implementation of REMONA model will mainly find use in service or manufacturing companies.

Research Limitation/implication: The REMONA model has only been tested and verified in IT services within service-oriented companies and the automotive industry.

Originality/Value of paper: The paper is valuable for IT managers, and especially CIOs – Chief Information Officers – and project managers. They can find here inspiration for cost allocation, planning, and profitability management in IT services. The article also briefly presents practical experiences with the model's implementation at two international corporations.

Category: Research paper

Keywords: corporate performance management; business informatics; economics efficiency; reference model; business intelligence; data quality

1 INTRODUCTION

As e.g. the publication of Antonova and Zapletalova (Antonová and Zapletalová, 2014) mentions, the worldwide rapid economic growth at the end of the 20th century and during the first years of the 21st century was followed up on with a crisis, from which present economy is still slowly recovering. The crisis brought a change in economic and social paradigms that provoked a bigger pressure on measuring the results quality and performance of not only entire economies but also individual companies and their organizational units. This pressure resulted in the development and gradual implementation of the systems measuring the performance of entire companies, their parts representing organizational or project units or, in some cases, virtual organizational structures (Bjerge, et al., 2016; Doucek, Maryska and Nedomova, 2013). In order for the measurement of economic phenomena, which is necessary for decision-making at all levels of a company's management, to provide a true picture of reality, it is important that the measurement system, including the system of individual indicators, be built on a system approach and thinking (Tavadyan, 2012). Such an approach can be exemplified by the frequently used tools that can generally be referred to as Corporate Performance Management (CPM).

The systems dealing with performance and performance measurement can boldly be described as the most quickly developing area of management of practically all companies. Their added value for all levels of management lies in their ability to provide required data in a required structure and especially at a required time thanks to the integration of information and communication technologies (ICT) (Solodovnikova and Kozmina, 2011; Wade and Recardo, 2001; Wibral, et al., 2013). In view of individual areas of management in a company, CPM tools can include different tools of monitoring the performance of different parts of a company, such as employee performance management, corporate ITC management, sales management, marketing management, etc. A typical example of the structure of CPM components is provided in Fig. 1.

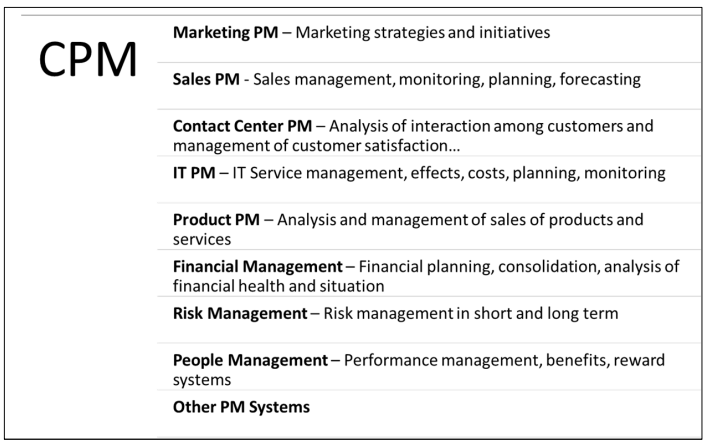

Figure 1 – Diagram of the CPM Concept and Its Parts (Advanced Performance Institute, 2016)

A methodological perspective offers another classification of CPM. Its individual areas are characterized in the publications (Cokins, 2009; Dimon, 2013; Eckerson, 2010). These are in particular:

- *Budgeting, Planning & Forecasting*. This area focuses on the preparation and creation of plans. Its important part includes support of the management of the processes creating budgets, plans and forecasts of their fulfillment by means of so-called workflow tools.
- *Profitability Modeling & Optimization.* This area is mainly based on the application of the so-called "What-If" analysis. Based on the analysis of problems, a manager creates possible scenarios and consequently analyzes their impact on the economic situation of the company and chooses the optimal solution.
- *Financial & Statutory Reporting.* This area is based on the requirement to unify the accounting reporting of organizational units of a company in different countries with different local accounting standards. The goal of financial consolidation is to provide an undistorted picture of the finances of a company.
- *Financial Consolidation.* This is similar to financial and statutory reporting but at the level of an organizational unit. Its goal is to integrate accounting data from different sources in an organizational unit into a consolidated entirety that will permit to evaluate its economic situation. Financial consolidation becomes more important in the case that a company is being fused or restructured.

However, CPM is not presently just a closed topic for a narrow circle of theoreticians; the importance of the research of its individual areas is confirmed not only by the publications of prestigious academic institutions, e.g. Carnegie Mellon Software Engineering Institute (Chrissis, Konrad and Shrum, 2011), the University of California, Berkeley, Cambridge University (Varian, Farrell and Shapiro, 2005), and Czech universities, e.g. the University of Economics in Prague (Wagner, 2009), the University of Tomáš Baťa (Popesko, 2010), but also by research projects carried out by private consulting corporations, e.g. Ernst and Young (2015) and Gartner (Potter, 2009) and state institutions e.g. in the State of Minnesota (MNsure, 2012). Our ideas for the model that we present here stem from these publications as well as many other documents.

Since the core of our article lies in corporate informatics management or more precisely in the application of the methods of CPM in this area, we needed to also include and to consider in our article the methods, norms and standards that are usually used in this area. It more concerns "good practices" standards that was transformed into internationally respected norms de jure or generally accepted standards de facto. There are many publications in this area as well – this topic has been discussed in detail in many studies and publications. The most worldwide used recommendations for corporate informatics management are published in the form of methodological frameworks - CobiT 5 (Isaca, 2012a,

2012b) and ITIL (Menken, 2011). Both of them similarly focus on corporate informatics management in general and also contain some recommendations, methods and guidelines for the management of the economics of corporate informatics. However, each framework approaches corporate informatics management a little bit differently. The CobiT 5 framework focuses more on the internal processes of management (it was originally created for the top managers of a company so that they could supervise the running of the IT Department via auditors) while the ITIL framework deals with this issue more from the perspective of provided services (the original purpose of this framework was to provide a procedural model for corporate informatics management oriented on the provision of services; its part is presently used as the standard ISO/IEC 20000). A separate part of management, which we also had to take into consideration, includes the indicators and measurement of corporate informatics outputs and performance, which is analyzed in detail in the publications (Grembergen and Haes, 2001; Parmenter, 2010). These publications can be currently considered one of the best and most detailed sources in this area.

The entire group of corporate informatics management tools, sometimes also referred to as IT Governance or the IT Governance Framework, has become a part of the majority of modernly managed companies' management concept, which is referred to as Corporate Governance (Balocco, Ciappini and Rangone, 2013). This interconnects the achievement of a company's strategic goals with the goals and tasks formulated in the information strategy.

In spite of a detailed analysis of the sources concerning CPM, corporate informatics management, IT Governance, Corporate Governance and outputs and performance measurement, we were not able to identify a corporate informatics performance management model (Fig. 1) that would be described in such a comprehensive way so that it could be consistently applied to all areas of the management of the economics of corporate informatics. Besides, the identified models are of a more theoretical nature and do not interconnect its basis with the multidimensional concept of data storing that is nowadays necessary for their implementation.

Based on the research of available world and local literature that was mentioned above, we found out that there was currently no economic model (Dimon, 2013; Grembergen and Haes, 2001; Keating, 2016; Ventana Research, 2012) that comprehensively deals with:

- The key links between the individual levels of corporate management and corporate informatics management;
- The management of the economics of corporate informatics and its tasks, including the tasks of cost allocations and profitability planning and management;

- Support in solving the problems that arise from corporate informatics management and the management of the economics of corporate informatics but are not handled as mentioned e.g. by Grembergen and Haes (2001), Keating (2016) and Kugel (Ventana Research, 2012).

It's true that exists plenty of proprietary solutions created by companies for their private use only and that are created according to their specific requirements. But general solution that could be fast and easily implemented is missing. This gap is covered by the Reference Model of Optimization of Cost Allocation and Planning for IT Management (REMONA) developed and elaborated on by the authors. It supports the selected processes of the management of the economics of corporate informatics that have a major impact on improving the effectiveness of provided IT products and services in a company.

2 PROBLEM FORMULATION

Current IT economic practice missed general solution that could be fast and easily implemented into company and helps this company in management of selected areas like cost allocation based on modern approaches, planning and profitability management lacks a generalised solution that is fast and easily implemented into a company and can help it to manage selected areas such as cost allocation based on modern approaches, planning, and profitability management. This paper's main goal is to resolve this gap.

The paper's main goal is to present the REMONA model, to spark professional discussion of the concept behind it, and to present experience with the verification of this model.

Besides our main goal, which addresses the identified gap in general, we have identified other tasks intended to refine the main problem identified and to specify the limitations and expectations for the REMONA model:

- Analyze cost allocations and profitability planning and management within the context of managing the finances of corporate informatics and its specifics;
- Provide the reporting needed for corporate informatics management;
- Develop a general software application based on the proposed model that can be tailored to the needs of a specific company;
- Verify the developed application by way of its pilot implementation at selected companies.

3 METHODOLODY

This paper involves applied research. Within it, we use the Design Science Research Methodology (Peffers, et al., 2007). The phases of this method will be fulfilled as follows.

Based on a review of the appropriate literature we have determined that due to the weathering of the economic crisis and very unpleasant ecomomic development, there is an increasing tendency to bolster the rational, effective, and effective disclosure of financial and human resources to ICT governance in companies. For example, the literature (Balocco, Ciappini and Rangone, 2013; Dimon, 2013; Cokins, 2009; Ventana Research, 2012; Wagner, 2009) shows that issues of cost management and distribution for individual orders in internal ICT management are not addressed adequately. The overall lack of ICT governance has been identified by us as a missing application to manage corporate ICT performance. The key problem that the paper deals with is the introduction or increasing of the ability to manage performance in an organization environment.

The paper's objective is to facilitate the solution of this problem. The artifact that is intended to help approach the problem is the performance management model, as well as the methodology for its creation within the organization environment. We will prepare a solution for measuring the performance of corporate IT management and verify it in practice. This solution is based on the application of the cost allocation approach in the specific area of business informatics, planning, and the planning-process phase, including the planning workflow and the application of profitability processes and procedures in the area of business informatics. The solution itself is based on the concepts for corporate IT management as it has been addressed at the Faculty of Informatics and Statistics, University of Economics, Prague for over 10 years. The model extends the understanding of the MMDIS (Multidimensional Management and Development of Information Systems) methodology, which is described for example in (Vorisek, Pour and Buchalcevova, 2015; Vorisek and Pour, 2012, 2015). The mental model for this concept is based on the multidimensional concept of enterprise informatics and its management, which distinguishes in particular the following dimensions: hardware, software, data/information, processes, working – the social and ethical dimension, organization and law and economics, and financial management.

The present solution extends and complements the overall concept, in particular in the block of economics and financial management of business informatics.

The development of the model was based on several sequential steps. The first was review of a current situation in the area of financial management, especially as it applies to business informatics. We had to identify whether or not such a model/models exists, and if so, what is missing in the model/models. We then formulated initial concepts, which we validated in practice, and we discussed these concepts with profesionals from practice and various academic institutions. These concepts were also tested at real cases, ultimately leading to the definition of the final concept for the model that is presented in this paper.

Case studies demonstrate the use of the created artifacts within the environment of two international companies (Case Study 1: a consulting services company; Case Study 2: an automotive company) while using the proposed methodology.

The implementation of the model in each case study was based on five phases:

- Phase 1: Identification of the reason for introducing the REMONA Model at the target company, the business requirements, and the project configuration;
- Phase 2: Analysis;
- Phase 3: Draft data warehouse and ETL for its fulfillment;
- Phase 4: Implementation of ETL and the REMONA Model;
- Phase 5: Testing and verification of the configured REMONA Model.

Each of the companies included in the case studies was from a different industry. This help us to create a model that was more general and thus more usable at a variety of companies.

The data used for the model was provided by the companies from Case Studies 1 and 2. We were using a subset of the real data. "Subset" here means that we did not use all company data (the full history) but rather the last two years only for Case study 1, the last year only for Case study 2. We used the selected companies' internal data sources, for their example accounting data, management and project management reports, final accounts, balance sheet, cash-flow report, etc. The data was anonymized so that it could be published in the form of reports (Maryska, 2014).

4 PROPOSED MODEL

Prior to starting with the proposed new solution, i.e. the modification and expansion of existing processes of business informatics economics management we identified which processes are crucial in business informatics and integrated them into the model.

We divided the processes that we identified in business informatics economics management and specified as a fundamental part of the proposed model into two levels. The first level is represented by the master process, which is built up from second-level processes (sub-processes). We called the master process IS/ICT Economic and Financial Management. The sub-processes are as follows:

- Analysis of IS/ICT costs;
- Analysis of financial requirements;
- Analysis of financial resources for IS/ICT;
- Analysis of planned and executed effects (benefits) created by IS/ICT;
- Planned IS/ICT effects;
- Planned IS/ICT costs;
- Preparation of an IS/ICT investment plan;
- Preparation of an IS/ICT budget;
- Proposal for procurement of financial resources for IS/ICT.

We defined the basic characteristics for each sub-process, such as data inputs, the procedure for approaching individual activities, the sequence of individual activities in a sub-process, cooperating sub-processes, outputs, and the roles involved in the life cycle of a sub-process. The mutual interaction and sequence of sub-processes are this methodology's fundamental differences relative to the ITIL, CobiT and Val IT methodologies, whose processes are not as detailed and are not incorporated into a comprehensive company-wide process.

In order to utilize the support of Business Intelligence (BI), we proposed suitable dimensions for each sub-process, which represent an analytical viewpoint for the evaluation of the monitored indicators, and indicators, which express numerical values from the viewpoint of different dimensions and allow a detailed data analysis (for more details, see Doucek, Maryska and Nedomova, 2016).

Using research in literature, consultations with the ICT managers at the pilot companies, and survey sampling among economic entities, we identified the dimensions that we consider relevant for business informatics financial management. We defined each dimension as regards:

- Its purpose, a reference-model definition of contents and the link to business processes and management methods;
- The attributes of the dimension's elements and a description of their contents;
- Its overall basic structure; there can be several structures depending on the purpose of its utilization.

During the analysis, we discovered that the borderline between individual groups of dimensions may not be very clear. We thus placed the "borderline" dimensions in the group where, in our opinion, they would be used the most. We divided the dimensions of IS/ICT financial management into the following groups:

- Basic business dimensions, i.e. dimensions regularly used in most BI applications (e.g. time, providers, plan – actual, business goals, business processes, business departments, business customers, etc.);
- Basic informatics dimensions (e.g. databases, projects, services, software, business informatics applications, technical resources, etc.);
- Economic dimensions and performance dimensions (e.g. categories of effects, cost types, budget, financial, and cost accounts).

The configuration of the dimensions is very important for this model, since it determines the basic scope of the analytical and planning applications. Dimensions are covered in detail in (Novotny, 2003).

From the list of indicators proposed in (Novotny, 2003), we selected a set of indicators that corresponded with the needs of business-informatics financial management and expanded this set with other indicators, based on an analysis of information sources and business requirements. In this case, our information sources were e.g. (ITIL, 2001; Isaca, 2012a, 2012b).

Identification of the methods for identifying and evaluating indicators in mutual relationships is an important part of the model. This part of the solution is described in detail in (Maryska, 2014). The proposed model includes the following procedures:

- Traditional and modern calculation methods (e.g. Activity Based Costing) intended to analyze information on the cost of individual sub-processes, products and services, based on an analysis of activities and relationship quantities;
- Cost/Benefit Analyses (CBA) intended to evaluate and compare the effects and costs of projects, products, and services;
- Earned Value Management focusing on monitoring and evaluating the basic financial parameters in project management, e.g. the labor and time spent on a project and the project's costs, and analyzing some performance characteristics of a final product, e.g. informatics applications.

Traditional methods of project evaluation, e.g. net present value, internal revenue percentage, return on investment, average annual cash-flow, profitability index, payback period, and more.

The proposed model is based on the analysis of the existing models that are specified in previous part of this article, on the business experience of the authors and on the identification of the areas that are not analyzed in the current models and methodologies, yet are very important from the point of view of business practice and scientific theory. The actual proposal is divided into four separate parts:

- Architecture,
- Business logic,
- Data model,
- Service parameters.

The basic conceptual diagram of the REMONA model is shown in Fig. 2. The proposed model is based on the traditional architecture of the CPM solution, which is adapted to the specifics of the area into which the solution is implemented, i.e. also to the specifics of the model, to permit its easy integration into the corporate architecture of a regular company. The target proposal of the REMONA model is covered with a rectangle called "Model REMONA". It contains three basic parts – tasks, dimensions and indicators - and the REMONA application.

The REMONA model covers three basic business tasks that companies currently very often deal with and which were in detailed described above (processes,dimensions, metrics etc). These three general business tasks concerns planning, cost allocations and profitability. For the purposes of their realization, the model proposes dimensions and indicators. Both these components are integrated in the proposed database into multidimensional data cubes that make it

possible to easily and quickly adapt the model to the needs of a specific company.

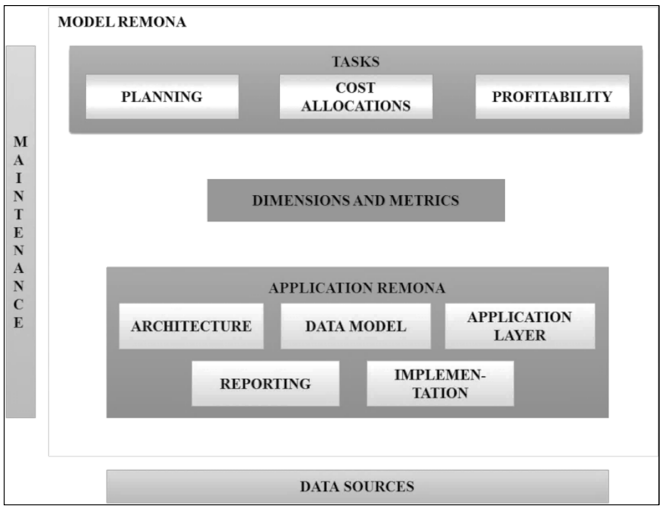

Figure 2 – REMONA Model – Conceptual Diagram

The so-far mentioned parts of the model (Tasks, Dimensions and Metrics) describe the model as a theoretical concept, but for the end user it is the application with which he works, i.e. the application support - the "Application REMONA", that is important. Since data sources, which are different in every company, are crucial for any similar application, the proposed model includes its own data model. The application layer represents its own business logic that integrates the mutual links of proposed dimensions and indicators into multidimensional cubes and thus contains the physical realization of the proposed theoretical concept. The key part of the solution from the point of view of the users is the reporting layer that represents the main user interface and the communication tool of the model with the users.

A separate part of the proposed model was its pilot implementation in selected foreign companies.

4.1 REMONA Architecture of the REMONA Model

The model architecture that is based on the traditional BI architecture. The architecture of the REMONA model is modified based on its specific needs arising from its implementation in corporate informatics with the goal to permit its easy integration into the corporate architecture of a company.

The proposed application of the REMONA model satisfies the basic postulate that it can be implemented on any platform with multidimensional support (e.g. the platforms Cognos TM1/Express, Oracle Hyperion, MS Sharepoint Server 2014, etc.). It is thus possible to create dimensions (e.g. time, product) in multidimensional data cubes).

As an example of this aspect of the proposed solution, we can mention a multidimensional cube with the assumptions of data for planning (the assumptions are the defined parameters that affect the solution as a whole, e.g. planned discounts, value-added tax on provided services, etc.). Such a cube is connected to all other cubes with the data of the plan where it is necessary because of the automated completion of the planning cycle. As an example, we can mention the interconnection of the cube of the assumptions for the plan with the data cube of the planned product contribution that permits to calculate the items derived from the assumptions – e.g. the cost of provided IT services, etc.

The proposed REMONA application includes a general model of the "REMONA Data Warehouse" that is used only for the purposes of the proposed model. This data warehouse/mart supports the realization of the tasks of planning, cost allocation and profitability management as well as the analytical tasks carried out within their context. Some of the key forms and reports supporting the handled tasks are identified at the end user layer.

The solution is proposed from the point of view of end users in such a way so that the reference model would make it possible to:

- Define the business drivers of individual products/services provided by corporate informatics as well as their relation to revenues or costs;
- Easily change and develop the solution – e.g. to change/harmonize the logic of the relation of the business drivers defined for corporate informatics to the revenues from a selected product without any impact of such a change on the logic of the calculation of the revenues from another product;
- Eliminate errors and the risk of creation of different versions of the plan that are not in compliance with the goals of corporate informatics;
- Simplify and well arrange the process of planning thanks to the use of workflow applications;
- Ensure the credibility of the data used for planning and potentially for analyzing as well – thanks to the layer "Data Layer - Data Integration" that will ensure a definite way of importing data from primary data structures;
- Improve the process of cost allocation and of consequent analysis of the profitability of products and services provided by corporate informatics.

The model architecture is based on three basic layers of the solution, i.e.: *Data layer; Application layer; End user interface layer.*

The *"Data layer"* solves the tasks concerning the processing of data from primary systems and their storing in the "REMONA Data Warehouse." The layer can be divided into "Data Sources," "Data Integration" and "Data Management."

"Data Sources" are represented by the database of different information systems inside as well as outside a company that provide primary data for the proposed model. Data sources are usually different internal and external databases

(company data warehouse, transaction systems and other) that are used by different applications supporting main and secondary processes in a company, such as e.g. accounting, quality management, human resources management, etc. In addition to large databases, different small data files or local agendas, e.g. in MS Excel or text files.

The layer "Data Integration" is dealt with ETL tools and data quality assurance tools. The layer "Data Integration" ensures the processing of data from data sources in the form expected by the REMONA data warehouse created for the proposed model.

The key output of the data layer is the created "REMONA Data Warehouse" that represents the database to which the application layer and, through the application layer, the end user interface layer are attached. The data in the data layer are integrated and prepared based on the needs of the application and analytical layer.

The *"Application layer"* is represented by the tools that help to solve the actual CPM tasks. In this specific case, it concerns the tools that support the creation of models for planning, cost allocation and profitability. The possibility to analyze other models as well as the data in the data warehouse represents an important part of these tools.

"End User Interface" – is the only layer where the end user comes into contact with the REMONA model. This layer contains cooperation supporting solutions and in particular individual types of output expected by the users of the solution. The key types of output in the end user layer include a portal with available dashboards for defined and authorized users, tools for interactive and operational reporting, etc. Forms, through which the user can enter defined data in the REMONA model, constitute an important part of the end user interface as well.

4.2 Business Logic of the Model

The business logic describes the concepts of planning, cost allocation, profitability management and related handled tasks. Its important part is also the link to dimensions, indicators and the user interface that is represented by the reporting layer, i.e. the user output layer.

When creating the model, we focused on the following three basic business tasks:

- Planning and the planning process phase, including planning workflow,
- Cost allocation,
- Profitability.

The common feature of *Planning and planning process phase* is that it is usually done in parts in several steps at different management levels, and different employees create the plan. Because of this fact, it is very important to correctly set up the planning process and especially to support it with planning workflow tools. If correctly set up, the workflow simplifies, speeds up and refines the

planning process and makes it possible to quickly and easily identify the current status of the planning process, the person who has not yet fulfilled his tasks, etc.

From the point of view of *Planning tasks*, the authors consider the most important areas. The first one is the plan of product contribution that can initially be created based on the plan of revenues, e.g. from provided IT services for the first year. The second one is the plan of personnel costs represents the most significant cost of IT. In this context, the planning is done mainly based on the list of current employees, their positions and assumed changes in the number of employees. Onother one is the plan of center costs can be defined based on the list of general ledger accounts. This mainly concerns operating costs incurred from the regular operation of in-house centers. The fourth plan is the plan of fixed (CAPEX) and financial costs and depreciation represents the planning of investments, i.e. the acquisition of assets, the planning of a gradual reduction of the value of assets and its recognition as an expense, i.e. in the profit and loss account. Investments are primarily planned by individual centers that allocate investments to orders (products).

With respect to the tasks of *Cost allocation*, the authors found it important to describe the basic principles of cost allocation the way they are implemented in the REMONA model and should be handled in corporate informatics management. They are depicted in Fig. 3 and Fig. 4. The basic principle of cascade cost allocation is shown in Fig. 3. The abbreviations CC1-CC4 represent cost centers the way they may exist in a company. E.g. CC1 can be described as Administration (assets, building, etc.), CC2 as the IT Department, etc. "Cost Centers" must be always set as a dimension so that their number could be dynamically changed, based on the needs of the implementing company. As a result, individual types of cost are set.

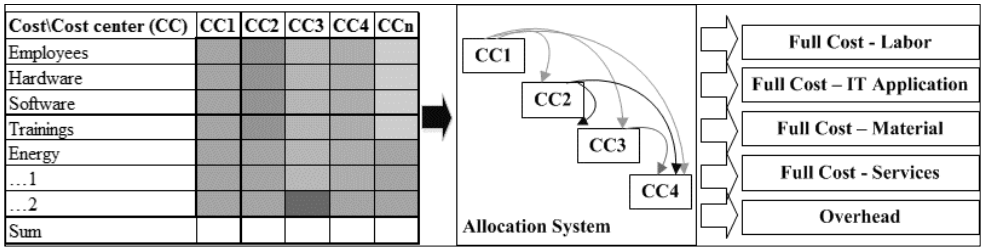

Figure 3 – Principle of Cost Allocation

Fig. 4 presents the application of the ABC (Activity-Based Costing) method, which is based on total costs divided by type and, based on defined Drivers, further subdivides them into "Activities" and "Processes" that create a product or service. Total costs are then compared with "Revenues." "Revenues" are added to the calculation as an external element.

From the point of view of cost allocation, the model provides unique funkctionality. The first one is recognition of costs through cascade allocation. It

concerns costs that cannot be directly allocated to products. Model provides an environment for the allocation of costs to products. Provides for a solution containing both allocation and the reporting basis for evaluation and analyses.

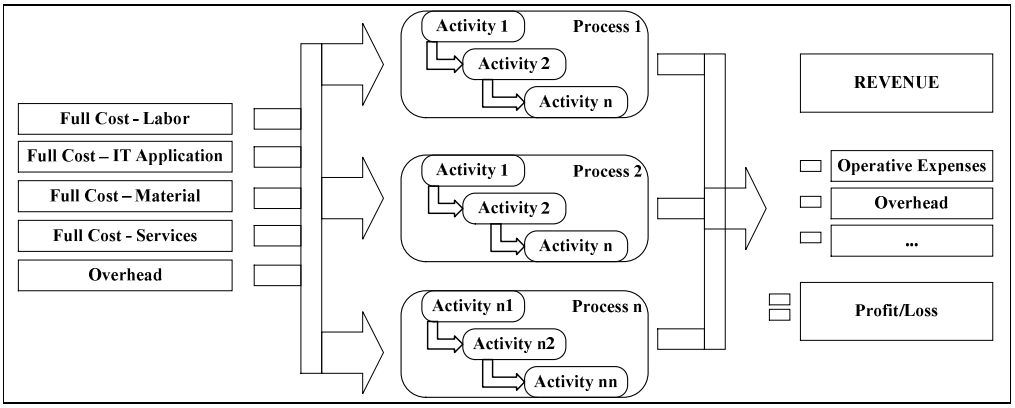

Figure 4 – Principle of Cost Allocation

4.3 Data Model

The data model is primarily based on consolidated data sources that are usually represented in companies as the "Company Data Warehouse." In the case that the structure, details or contents of the data in the warehouse are not in compliance with the needs of the analytical tasks that will be performed in the proposed model, it will be possible to use other data sources, such as e.g. external sources or data sources from other company applications. It is always necessary to prepare data integration tools for data migration and transformation. The quality of data is always dealt with in data processing. The so-far mentioned two layers are not the primary goal of the proposed model and will always be specific for each implementation.

The conceptual data model is divided into four comprehensive parts that are further specified all the way to the physical data model that is implemented in the selected database technology. The conceptual model is divided into "Finance and Managerial Accounting", "Operating Data", "Cost Allocation and Planning" and "Other". Each area covers a specific area. "Cost Allocation and Planning" covers in particular data connected with the setting of cost allocation parameters, which include the setting of the dimensions "Cost Center", "Cost Drivers" and "Activities and Processes". "Operating Data" are data arising from the regular activity of a company, such as the sale of goods and services. "Finance and Managerial Accounting" focuses on data sources related to financial and managerial accounting.

4.4 Service Parameters

In proposing the model and implementing the entire system, it is necessary to first answer several key questions, the recognition of which affects the preparation of the proposed model. All these questions represent service parameters that must be taken into consideration so that the proposed solution could be configured and easily adapted to the needs and goals of the company that implements it. The main questions that we considered in the proposed model with respect to the parameterization of the solution are as follows:

- What key indicators are required for the management of the economics of corporate informatics? How are they interconnected with the achievement of the system of goals of a company as a whole? Are any in use at present?
- What are the current or expected main problems in the economics and management of the operation and of the development of corporate informatics and what are their solution priorities?
- Has the level of maturity of the processes of corporate informatics management been analyzed and what are the results?
- What level of detail will be necessary for analytical tasks in the management of the economics of corporate informatics?
- How is the cost of informatics monitored, and what is the position of cost analysis in corporate informatics management?

These questions are crucial for the practical solution and for the implementation of the system in corporate architecture and in corporate informatics management. It is obvious that the answers to these questions will vary from company to company. Based on their varying, it will be necessary tomodify the proposed solution by means of parameters and adapt and adjust the proposed model to the needs and requests of the representatives of the companies where it will be implemented.

The actual parameterization of the solution means, that users can dynamically creates hierarchies in dimensions, implement new indicators into the solution and create new outputs from the solution, based on user requests. Wery important is independency on primary data sources that serve as a data source for “REMONA Data Warehouse” and are always specific for a concrete company due to different data sources and automatization of the solution where output data can be prepared both based on a scheduled task set up for a certain time and based on a customer’s ad-hoc request.

5 VALIDATION AND KEY SUMMARIES

The model was verified in two international companies working in the area of Consulting Services and the area of Automotive Industry (Maryska, 2014). Targets of both case studies were verification, validation and improvement of the

proposed REMONA Model. Names of the companies are not published – all provided data is marked as a trade secret.

Key users identified the following facts which needed to be adjusted in the solution:

- amend the solution by including a new dimension Channel – requirement accepted and implemented,
- amend the solution by including new metrics – requirement accepted and implemented,
- amend the description of the rules which are part of the solution – requirement accepted, description addressed outside this paper with regard to its limited scope,
- expand the set of pre-prepared reports – requirement rejected, it is not possible to implement all the company's requirements.

During the pilot implementation, the author identified several key factors that affected its implementation. The most important factors were identification of the requirements and expectations of key users, identification of the roles (and parts of these roles) that can support the proposed REMONA Model, the complexity of the data sources that need to be first understood and then cleaned, consolidated and recorded in the database via the transformation procedures (ETL), the comprehensive of the allocation rules, which can require quite complex solution parameterisation, the complexity of the dimensions and their hierarchy, which can require quite complex solution parameterisation and can subsequently affect the definition of the allocation rules, and various reporting requirements, which may make it necessary to create new reports according to the needs and requirements of the specific company.

One key area for every company is the cost aspect of implementing such a model. The costs in MD (Man Days) related to the implementation of this model were approximatelly 15 MDs. This number can be broken down into several areas. The first set of areas included the analysis of the existing solution + the identification of data for DWH, which amounted to 3 MDs of work, the analysis of the configuration needs, which took 1 MD, and the analysis of the solution extension (2 MDs). The second set included adjustment of the solution, including the proposal and implementation of DWH/ETL/Reporting, which took 5 MDs, and the configuration of the solution, which represented 2 MDs of work. The last part of implementation was testing, which needed 4 MDs. The total implementation time was 15 MDs. Total implementation costs can be calculated as a 15 MDs multiplied by the daily rate.

The savings achieved by implementing the model depend on the salary of the given company's employees. The savings are mainly in the form of a reduction to the amount of time needed for analyses and and of easy access to required information on daily/monthly bases without manual work, since all activities for providing this information are automated.

The most variable elements of the implementation are expansion analysis, solution adjustment and testing. These may change according to the specifics and needs of the target company. The model is proposed so that in terms of the basic functionality it can allow its implementation WITHOUT extensive additional adjustments. The objective of the solution is that it can be implemented with less costs than 20 MDs.

6 CONCLUSIONS

The proposed theoretical concept and the apparatus of the REMONA model have been developed as a software application in chosen technology, which was used in the pilot implementation of the REMONA model in selected foreign companies. The pilot implementation in the companies mentioned in case studies 1 and 2. has proven that the proposed REMONA model simplifies the processing and analyzing of certain economic tasks that are presently considered crucial. The REMONA application can mainly be used in companies oriented on services and in production. Its advantages lie mainly in:

- The processing and interconnection of CPM and BI, including the assumptions and problems with implementing the solution in this area;
- The identification of selected methodologies and models related to the tackled issue and their mutual comparison;
- The identification of key indicators that should be used in cost allocation, profitability and related analytical tasks;
- The proposal of dimensions that are necessary for solving the mentioned economic tasks;
- The methodology of the implementation of the proposed model in a company – the specification of implementation procedure, including the procedures and options of adaptation of the proposed model to the characteristics of a target company.

The reference model that will help to increase awareness about the relationship between corporate informatics and other organizational units of a company through the proposed drivers and activities that corporate informatics provides and other units of a company use. The model enables to put into operation the tool supporting the management's decision-making in corporate informatics.

The proposed REMONA model will help the companies that will implement it in their corporate informatics management to simplify and speed up their internal analytical processes. It will mainly allow to provide more:

- Provide more quickly information about the cost allocation and profitability of individual projects, products, services, etc.;
- Provide more detailed information about the cost allocation and profitability of individual projects, products, services, etc.;

- Provide more accurate information about the cost allocation and profitability of individual projects, products, services, etc.;
- Plan faster and more accurately and reliably thanks to a pre-defined workflow based on a selected dimension (usually an organizational structure dimension);
- Forward comments to the planners in the case that a plan needs to be redone;
- Arrange well and check easily the individual planning steps and the meeting of defined deadlines;
- Use pre-prepared automatic reporting combining the aforesaid benefits and allowing users to easily and quickly obtain needed information in needed details.

The pilot implementation and consultations with key users in companies have confirmed that the basic principle of the model and the method of its implementation are correct.

The importance of this model for theory and practise is based on fact, that this model takes into accout the best experience from existing models and methods. These are evolved and extended not only for theoretical concepts but also for best practices gained from practical implementations and validations. The most important points of the model is ability of fast implementation into selected company. The most important precondition of this fast implementation is fact, that company has qulity data sources and key financial processes are set.

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CSR in Sustainable Development: Comparative Analysis

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ABSTRACT

Purpose: To identify global and national trends in the development of CR reporting, the main difficulties in the CSR extension in Russia and suggest ways to improve a policy framework in the sphere of GRI based on the analysis of non-financial reporting by countries and regions of the world.

Methodology/Approach: Researching and writing the article one uses a combination of systemic and structural-functional approaches approach. The argumentation of the main provisions and conclusions is based on the application of comparisons, statistical, graph and tabular analysis methods. The information and empirical basis of the study are the legislative and normative acts of the Russian Federation, industries and regions development concepts and programs, data of state statistics bodies, materials of periodicals, conferences, roundtables, seminars, as well as the results of intermediate research carried out by the author personally.

Findings: The essential feature of the Russian CSR model is the decisive role of the state in its development. Non-financial reporting in Russia develops with slower rates than in developed countries. The methodological weakness of the reports is reflected in relatively low share of integrated reports, their incomplete compliance with international standards, methodological differences in calculations of the similar indicators. Development of CSR in Russia is connected with further study and adaptation of international best practices including a six-stage model of CSR policy formation.

Research Limitation/implication: As a result of the study, the main difficulties in the CSR extension in Russia were identified which are typical for all Russian regions and industries. Regional authorities can conduct an analysis of local difficulties and problems on this basis. The six-stage model of CSR policy formation can be used at any level of govenance with minor modifications. As a complex, these measures will solve the identified problems both at the level of regions and Russia as a whole.

Originality/Value of paper: The comparative analysis results of non-financial reporting development are author's and can be used as a basis for further analytical calculations. The findings, difficulties and directions for improving sustainable development policies in Russia in a complex develop theoretical knowledge on sustainable development, form the basis for the development and implementation of new practices within the policy framework.

Category: Research paper

Keywords: corporate social responsibility; sustainable development; non-financial reporting

1 INTRODUCTION

In a general sense, Corporate Social Responsibility (CSR) means a voluntary contribution of corporations to society development in the social, economic and ecological spheres, and this contribution is directly connected with the core activities of the company and is beyond a certain legislative minimum. This tool with the aim to achieve sustainable development goals is on a company's level.

The ideas grounding the concept of sustainable development (Brundtland Commission, 1987) and later concretized in a series of documents of the Conference on Environment and Development in Rio de Janeiro in 1992, are not principally novel for Russia. In the recent ten years, Russia has created institutional environment, regulatory and legal framework, which are directed to regulate many issues of sustainable development in individual regions and in the country in general (Hajduova, et al., 2016). The understanding of the role of companies in ensuring sustainable development of the economy and society has been changed. Nowadays, it is connected not only with the maximization of profit and company's value growth, dividend and salary payments to employees, but also with the contribution to the solving of social, economic and ecological problems. Corporate social responsibility and corporate sustainability are considered as a new step of the economic relations evolution, transition to a new paradigm of sustainable development on the global and corporate level.

The following documents contribute to that: The UN Sustainable Development Goals of the 2030 Agenda for Sustainable Development (Sustainable Development Goals, 2015), decisions of the Paris Climate Summit, Action Agenda for Financing for Development in Addis Ababa, Task Force on Climate-related Financial Disclosures by the Financial Stability Board, Mandatory ESG-reporting Requirements (LSEG, 2017), which strengthen the interest of various stakeholders towards the company's impact on the economy, society and environment.

This tool is relatively new for Russia. The problems of its practical implementation are due to the deficiency or imperfection of methodological and legislative basis, business mentality, corporate culture, weak policy in the sphere

of sustainable development in general. In this connection, the international experience is of great interest and its adaptation could promote CSR development in Russia.

2 GENERAL THEORETICAL PRINCIPLES

The modern CSR structure includes the following aspects:

- the triple bottom line (economic responsibility – profit, ecological responsibility – planet, social responsibility – people) (Slaper and Hall, 2011);
- responsibility to internal and external stakeholders;
- liabilities to stakeholders, these liabilities both are enshrined in the law and undertaken on a voluntary basis.

As a rule, the responsibility is implemented through the following types of activities: elaboration of a corporate social policy of a company; corporate management and corporate ethics; labor protection; elaboration of a policy in the sphere of environmental protection; environment-related activities; human resources management (programs for personnel development and raising of their living standards; social investments); interrelations with local communities, authorities, mass media; corporate charity, sponsorship, volunteering; fair competition; anticorruption efforts; reporting, transparency and public information on the company's activities; public service advertising and others.

CSR has a multilevel character, i.e. basic level (performance of legislative and regulated liabilities); high level (includes types of liabilities mostly connected with social investments, labor and environmental protection); advanced level (covers all the types of activities, including charity).

The Russian model of CSR in terms of driving forces, practical application and role of non-governmental organizations is something in the middle between the British model (initiated by business) and the continental model (state initiative and clear legislative framework). The Russian CSR model is oriented to a narrow group of stakeholders, including the state, owners and employees of companies. Local communities, suppliers and others are not included in this process to the full extent for the time being. The essential feature of the Russian CSR model is the decisive role of the state in its development.

Non-financial reporting is of a crucial significance for the CSR development, for studies and improvements of this system all over the world. Let us discuss it in more details.

3 NON-FINANCIAL REPORTING AND ITS DEVELOPMENT IN RUSSIA (COMPARATIVE ANALYSIS)

3.1 General Characterization of the Situation

The growth of demand for reliable and transparent information stimulates ever-growing use of tools of independent assessment of company's operations on the basis of the analysis of their public and non-financial reporting (Dragunova, 2006).

Non-financial reporting means documents officially published by companies, these documents present to stakeholders data on results of the companies' activities in the sphere of CSR and sustainable development. As a rule, such documents contain data on the company's strategy, observance of ethical principles in business operations, quality of the corporate management, contribution to environmental protection, observance of human rights, human resources management, quality of products and services, support to local communities, impact of the company on the society through all the key directions of its activities including of intangible assets (Khomenko, 2014).

The development of non-financial reporting in Russia is in the early stages, and it is characterized by the following factors.

1. Regulatory processes. Requirements of the ESG-reporting. Here the following documents should be mentioned: Corporate Governance Code of the Bank of Russia and Concept of Development of Public Non-Financial Reporting.

The Code contains direct recommendations to disclose the following information in the sphere of social and environmental responsibilities:

- policy in social and environmental spheres;
- reports on sustainable development prepared in compliance with the international standards (GRI);
- results of the audit of quality management systems, certification of the quality management system in compliance with the requirements of the international standard.

The Concept of Development of Public Non-financial Reporting (elaborated by the Ministry of Economic Development of the Russian Federation) determines the principles and forms of the public non-financial reporting, mechanisms of its preparation, internal control and external evaluation. It refers mostly to large-scale enterprises (Amanzholova, 2014; Amanzholova, Fribus and Khomenko, 2016).

It is supposed that the requirements of the mandatory non-financial reporting would be consistently extended to the following organizations taking into account their compliance with the criteria of the range of activities: state corporations; large-scale state companies; partially government-owned companies and state unitary enterprises; companies included by the government

in the special lists of strategic and systemically-important companies of the Russian Federation; large-scale private companies, whose securities are admitted to on-exchange trading, as well as companies, which are included in Russian ratings as the largest organizations in terms of the total volume of revenue.

2. Independent assessment of the company's operation. Nowadays, there are designed various systematic national and industry ratings, as follows:

- indices and ratings in the sphere of sustainable development and corporate responsibility, for example, "Responsibility and Transparency" index and "Vector of Sustainable Development" index of the Russian Union of Industrialists and Entrepreneurs (RSPP);
- National index of corporate governance (National Association of Corporate Directors, Moscow Exchange, RSPP);
- Rating of fundamental (ecological-energy) efficiency (Interfax-ERA);
- Rating of ecological responsibility of oil and gas companies (WWF, National Rating Agency and CREON company);
- Rating of ecological responsibility of mining companies (WWF and Ministry of Natural Resources of the Russian Federation);
- Rating of forest management (WWF);
- Sustainable Development Ranking for Selected Russian Cities (SGM);
- Ecological rating of regions and cities of Russia (Lomonosov Moscow State University).

3. The RSPP National Register of Corporate Non-Financial Reports.

This is a database of voluntary non-financial reports of organizations operating on the territory of the Russian Federation.

3.2 Dynamics of Number of Non-Financial Reports

Non-financial reporting in Russia develops more slowly than in developed countries, which can be proved by the dynamics of non-financial reports and organizations reporting (Fig. 1).

The most complete information on the number of Russian companies which publish non-financial reports and on the approaches towards reporting is contained in the National Register of Corporate Non-Financial Reports and in the Library of corporate non-financial reports formed by RSPP (Feoktistova, et al., 2017).

Since 2011, a certain slow-up of the process is observed, which corresponds to the global trend, i.e. when the most large-scale companies have started to publish reports in a sustained way, the dynamics of the year-on-year increase of reports decreases.

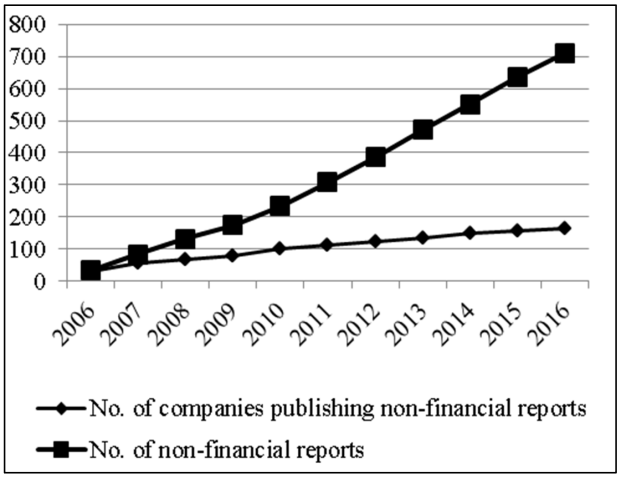

Figure 1 – Dynamics of Non-Financial Reports and Companies Reporting in Russia in 2006-2016 (Cumulative)

According to the open information of The World's Largest CR Report Directory «Corporate Register», the total number of organizations presenting non-financial reporting in the world was 13,936 (by the beginning of 2016), the total number of reports in the database is 83,914. Statistics per country and macro-regions looks in the following way (Tab. 1) (Corporate Register, 2016).

Table 1 – Statistics of Non-Financial Reporting per Country and Region of the World, 2016

Compared macro-regions / countries	**No. of organizations**	**No. of reports**	**Share in the No. of organizations**	
			of the country, %	**of the macro-region, %**
Western Europe	4,454	25,633	100	47.3
with the largest share in the number of organizations				
Great Britain	1,352	8,628	30.4	14.4
Germany	1,050	5,671	23.6	11.1
France	631	3,679	14.2	6.7
Southern Europe	1,634	9,634	100	17.3
with the largest share in the number of organizations				
Spain	779	4,199	47.7	8.3
Italy	572	3,589	35.0	6.1
USA	1,632	9,324	-	17.3

Compared macro-regions / countries	No. of organizations	No. of reports	Share in the No. of organizations	
			of the country, %	of the macro-region, %
Northern Europe	907	6,304	100	9.6
with the largest share in the number of organizations				
Sweden	390	2,633	43.0	4.1
Denmark	174	1,267	19.2	1.8
Finland	164	1,272	18.1	1.7
Norway	149	956	16.4	1.6
Canada	492	3,385	-	5.2
Eastern Europe	300	1,613	100	3.2
with the largest share in the number of organizations				
Russia	82	466	27.3	0.9
Poland	78	369	26.0	0.8
Hungary	63	314	21.0	0.7
Total	9,419	55,893	-	100

Large-scale companies in Italy, Spain and the UK are the leaders in the world in terms of the quality of CR reports.

Russia belongs to the group of Eastern European countries, where the processes of the CSR development are slow in comparison with that in other macro-regions (3.2% of the total comparative base). In its macro-region, Russia holds a share of 27.3% in terms of socially responsible organizations and 0.9% in terms of compared countries.

The comparison within BRICS countries also shows low positions of Russia in terms of the dynamics of non-financial reporting:

- Brazil – 520 companies and 2883 reports;
- RSA – 330 companies and 2201 reports;
- India – 156 companies and 856 reports;
- China – 111 companies and 504 reports, respectively (Corporate Register, 2016).

3.3 Dynamics of Number of Non-Financial Reports

The composition of companies which submit their reports in Russia corresponds to the international trends. As before, mostly large-scale companies operating on

the international level and on the financial markets prepare non-financial reporting (Tab. 2).

Table 2 – The Top Five Industries and Companies of Russia Submitting Non-Financial Reports, 2016

Industry	Key companies	Number of reports
Oil and gas	PJSC " Gazprom"; PJSC "Gazprom Neft" (JSC "SibNeft"); PJSC "TatNeft"; JSC "NOVATEK" ; PJSC "RosNeft"	12
Metallurgy and mining	JSC "Magnitogorsk Iron and Steel Works"; RUSAL (Russian Aluminum); PJSC "Norilsk Nickel"	11
Chemistry and petrochemical industry	JSC EuroChem; PJSC "Nizhnekamskneftekhim"; JSC "Siberian Chemical Combine (SKhK)"	10
Nuclear industry	The State Atomic Energy Corporation "ROSATOM"; JSC "TVEL Fuel Company"; JSC "RosEnergoAtom"	9
Electrical energy industry	PJSC "MOESK" (Moscow United Electric Grid Company); PJSC "Federal Grid Company - Unified Energy System of Russia"; PJSC "RusHydro"	9

But there are observed some distinctions between industries.

The *KPMG experts assessed* the quality of reporting among the world's largest 250 global companies. These were identified as the top 250 companies listed in the Fortune Global 500 ranking for 2012. In this survey they are referred to as "the G250" companies (KPMG, 2013). They are distributed per industries in the following way:

- Finance, insurance & securities (25%);
- Oil & gas (13%);
- Trade & retail (11%);
- Automotive (7%);
- Electronics & computers (7%).

In Russia, non-financial reporting is developed mostly in the fuel and energy complex.

3.4 Dynamics of Number of Non-Financial Reports

There are the following types of non-financial reports in Russia (Fig. 2):

- sustainable development reports (in compliance with the methods of Global Reporting Initiative, GRI);
- integrated reports (in compliance with the international standard IR);
- social reports (The Social Charter and Basic Performance Indicators by RSPP);
- environmental reports (statistical data forms of environmental reporting);
- branch reports.

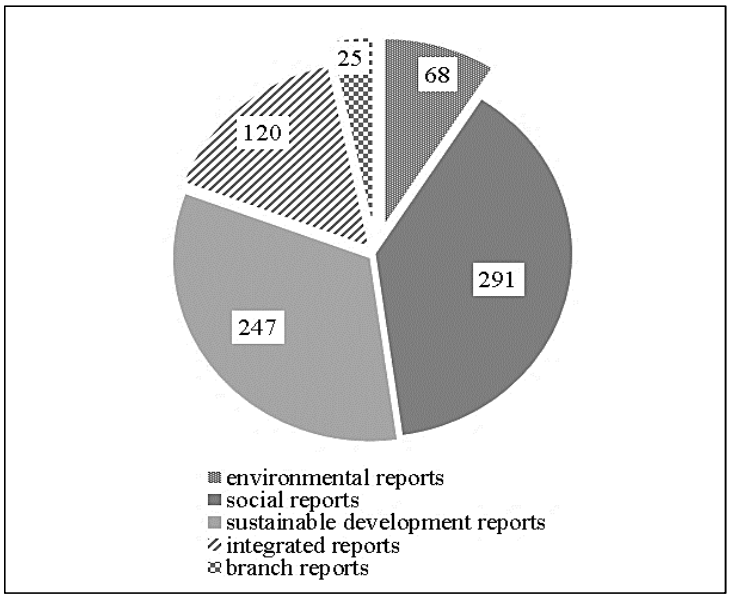

Figure 2 – Types of Non-Financial Reports in Russia, 2016

At the same time, the share of integrated reports in the total number of reports was in average about 74% in 2006-2016 (including integrated reports, 14%, social reports, 20%, environmental reports, 6%).

The integrated reports do not yet in the form and structure sufficiently differ from sustainable development reports or traditional annual reports, and they include as a rule the following issues:

- market analysis;
- financial and production results;
- corporate governance reports;
- industry-specific themes (in accordance with the materiality matrix);
- company's overview in the sphere of personnel management;
- company's overview in the sphere of environmental protection and social investments;

- financial performance.

The weak point in the methodology of reports preparation is a relatively small share of integrated reports, which, in their turn, are not always in compliance with international standards.

Nevertheless, Russia is in line with the worldwide trends of the CR reporting development:

- growth of data number;
- dynamic growth of number of reports in countries with developing economy;
- narrowing gap between branches of economy; CR reporting becomes a standard of practice regardless of a branch;
- growth of platforms and guidelines for reporting;
- growth of necessity in audit / assessment / assurance of public reporting.

4 MAIN PROBLEMS IN CSR DEVELOPMENT IN RUSSIA AND WAYS OF THEIR SOLVING

As a result of the study, the following main difficulties in the CSR extension in Russia can be identified:

1) Sluggishness of processes of integration of the concept, principles and indicators of sustainable development with strategies and systems of enterprises management.
2) Scarcity of financial resources for small- and medium-size companies for the implementation of a complex policy of social responsibility; in this connection, mostly large national companies, affiliated organizations and subsidiary enterprises of international companies located on the territory of the Russian Federation are involved in CSR processes.
3) Mentality of the Russian business, which used to work in the framework of short-term goals, thus minimizing risks, and which is not ready for long-term investments; relatively often changing political and economic situation in the country, that does not allow to change this mentality within a certain historic period; and, as a result, the established tradition to finance large social projects by the government funds only.
4) The spatial organization of the country with extended territories, low-level population density in some territories, underdeveloped infrastructure (including transport), concentration of capital in large megalopolises, does not stimulate companies to develop CSR.
5) Social passivity of the majority of the population of Russia, weak trade union movement. Strong parties and movements, associations, non-governmental organizations, which now act in the civil society structure, are created by the initiative of government authorities and local self-government.

6) Veiled compulsory nature of CSR, which is mostly pronounced in regions and on the local level, when enterprises are forced to implement social projects in order to gain preferences from local authorities; thus violating the principle of voluntariness, reducing confidence in the power, and demotivating companies to implement CSR. As a result, companies submit information referring to their support and development of the social sphere not to beneficiaries directly, but primarily to government authorities and local self-government.
7) The deficiency of comparable and balanced information, disclosed by different companies in terms of the same directions of non-financial reporting; different calculation methods, which cause different interpretations of the information presented in CSR reports. At the same time, it should be mentioned that Russian methods of CSR assessment are in compliance with the international standards (GRI, ISO 26000, AA1000SES, AA1000AS, SA8000). Thus, in particular, the RSPP basic indicators are in compliance with the GRI standard to the fullest extent possible. But they are limited to the scope of the standard data of enterprises, and they do not contain a set of indicators reflecting management and corporate government.

In order to solve these problems, first of all, it is necessary to elaborate and constantly improve a policy framework in the sphere of GRI (Srinivas, 2015; Albareda, et al., 2008). To this effect, it is proposed to use a six-stage model (The United Nations Global Compact, 2010):

- Stage 1. Understanding CR-relevant context.
- Stage 2. Defining corporate responsibility.
- Stage 3. Situating CR within a government structure.
- Stage 4. Defining the CR public policy rationale.
- Stage 5. Identifying types of policy intervention for CR.
- Stage 6. Monitoring and impact assessment.

As an addition to the mentioned model, the following factors are important:

- Strengthening of ecological aspects in the non-financial reporting, because the problem of climate changes would predominate in the world practice of non-financial reporting.
- Introduction of sustainable development principles into supply chains (business-models of companies).
- Elaboration of a uniform generally accepted standard of non-financial reporting (like a standard of financial reporting) taking into account peculiarities of the Russian financial accounting; management accounting, and statistical accounting, statutorily prescribed obligations.

As a complex, these measures would make it possible to start the solving of the problems mentioned above. But their complete solution is possible only in case of the participation of all stakeholders and within timeframes allowing for global

changes and changes in the mentality. To our regret, they are not limited by the near-term outlook.

5 CONCLUSION

The studies of international experience and results of quantitative and qualitative cross-country comparisons made it possible to identify the main trends and difficulties in the CSR development in Russia. The essential feature of the Russian CSR model is the decisive role of the state in its development. Non-financial reporting in Russia develops with slower rates than in developed countries, and it is prepared mostly by large-scale companies of the fuel and energy complex, as well as by companies operating on the international level and on the financial markets. The methodological weakness of the reports is reflected in relatively low share of integrated reports, their incomplete compliance with international standards, methodological differences in calculations of the similar indicators.

The further development of CSR in Russia involves overcoming of institutional, mental, financial difficulties, improvement of the policy framework of the state, further study and adaptation of international best practices.

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Process Capability and Data Contamination

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ABSTRACT

Purpose: The paper centres on process capability and its relation to data contamination. Process capability may be distorted due to imprecise data. The paper analyses to what extent capability changes reflect problems in data so that the changes can be attributed to data sampling rather than the true performance of the process. This is important because it is usually much simpler to increase the precision of data sampling than the process itself.

Methodology/Approach: The paper has two major parts. In part one, effect of data contamination on the observed process characteristic is analysed. The effect is analysed using data obtained from simulated random drawings and the chi-squared test. In the other part, reaction of capability to data contamination is observed. The capability is measured by a univariate capability index.

Findings: Regarding the sensitivity of the index to contamination, it is different depending on the capability before the contamination. This leads to conclusions about when the company using the index should focus more on the way the data is measured, and when it should focus more on improving the process in question. The analysis shows that if the company is used to high levels of capability and records its drop, it is worth analysing its measurement system first, as the index is at higher levels more sensitive to data contamination.

Research Limitation/implication: The study concerns a single univariate index, and the contamination is modelled with only several probability distributions.

Originality/Value of paper: The findings are not difficult to detect, but are not known in practice where companies do not realize that problems with their process capability may sometimes lie in the data they use and not in the process itself.

Category: Research paper

Keywords: capability index; data contamination; index sensitivity

1 INTRODUCTION

Semi-finished and finished products are often accompanied upon their distribution by a technical report that gives details about their observed technical features, so that customers are aware of how to handle them safely and effectively. This is a result of legislative requirements, which above all try to protect public health and ensure that products serve their original intended purpose, and customers' needs which form the demand and define the character of the supplied commodity. The technical features are usually quantifiable characteristics, which means that their levels are measured by a measurement system of the product suppliers or their business partners. This applies to most economic sectors, involving both light and heavy industries. The numerical characteristics are usually random variables because their level is affected by many factors and not all of them are under control during the production. In other words, certain noise is present. Because of the uncertainty, capability indices are frequently required by customers so that there is a general idea about where the levels of the features can be expected and with what probability. The indices are useful before the production becomes a mass production, which otherwise is informative enough regarding the product quality level fluctuations due to a long production sample history. However, they are also calculated once the production has its history and becomes mature because it is necessary to adjust the early-production rough values of the indices and make them more precise, and also because there must be a controlling mechanism ensuring that the production still runs its originally planned course and doesn't divert from it to an unintended territory. Once the indices are calculated, the production level they reflect is either accepted, or it must be altered if it is not satisfactory. Adjusting production is a huge task for any company, though, because of all the factors that enter the process. The factors involve composition and amount of materials, the number and character of production machinery, the character of operators, production environment encompassing air humidity and temperature and other production conditions. It is a complex and difficult task (Rzevski and Skobelev, 2014) but spending time and financial resources on production changes to bring its level higher might be completely unnecessary due to the possible fact that the indices do not reflect the true situation. One of the reasons that this case may happen is a potential contamination of the data the indices are calculated from, whatever the source of the contamination. If data distortion is present, it will most likely be a result of the imperfect measurement system used (Automotive Industry Action Group, 2010). The system is never perfect, strictly speaking. The question then is whether and how the indices are related to the data contamination. Is there any relation at all which would allow for the capability index used to signal that maybe the management of the company in question should first check the measurement system before rushing to change the production, because the system imperfections may have distorted the true value of the index? This paper tries to answer these questions.

The paper is divided into several sections. The following two sections describe the methodology used and the most commonly known univariate indices, and they also select the index which is in common use. Further, assumptions are introduced in the two sections, based on which the whole analysis of the problem will be performed. Section four analyses the selected index and the final section formulates essential findings and conclusions.

2 METHODOLOGY

The paper consists of two major ideological parts. In the first part, potential effect of data contamination on the *probability distribution* of the evaluated process characteristic is analysed. The contamination is represented by a random variable the distribution of which is not normal, but shares some properties with normal distribution, which are known to be its typical features. These features include symmetry of its distribution and its zero expected or average value. Also, as is the standard way of proceeding, the true uncontaminated process characteristic and the variable representing contamination are considered statistically independent (Greene, 2011), and the effect of contamination, or the distortion of the original variable by contamination, is mathematically expressed as an addition. It is assumed that the original uncontaminated variable is normally distributed, which is something that should be checked whenever capability indices are used, since most indices require this assumption for their proper use. The effect of contamination is analysed using sample data obtained from simulated random drawings, and the chi-squared statistical test is used to see if there is any distortion in the distribution of the originally normal process characteristic. In the next part, reaction of process capability to the extent of contamination is observed, as well, using differential calculus (Larson and Edwards, 2013). The *sensitivity analysis* allows one to make conclusions about when data contamination could be suspected if the capability changes unexpectedly. The capability is measured by a selected univariate capability index.

3 CAPABILITY INDICES AND ANALYSIS ASSUMPTIONS

Many capability indices have been developed over the years (Tošenovský, 2007), and we shall concentrate only on a particular one. Our attention will also be turned to the univariate case, which is the usual case in practice. Although multivariate indices exist, as well, it is more difficult for many companies to use and interpret them in practice and so the one-dimensional indices still dominate when it comes to their use.

Several generations of univariate indices were defined and analysed in the past, one following another in an effort to remove theoretical problems of their predecessors. The C_p index is one of the oldest, comparing the tolerance prescribed by customer, a measure of variation allowed for the observed process

characteristic, to the true variation of the characteristic based on its normal probability model. As is known, the index does not reflect in any way the potential diversion of the expected value of the characteristic from the customer-defined target value, which is something of primary interest to customers, and so the index fell out of favour in many industrial organizations. Its successor, the C_{pk} index, was a refinement in the sense that it recognized both not complying with the requirement that the characteristic be in average equal to the target value and the variation of the characteristic. On the other hand, one of the demerits of the index is that it can be misused – not being able to keep the target value can be substituted by a lower variation of the characteristic to the extent that the index will remain at an acceptably high level. Customers not analysing the genesis behind the calculation of the index will thus be fooled into thinking that everything is well with the company whose index they observe. The efforts made at removing this theoretical drawback resulted over time in a next-generation capability index – the C_{pm} index. This index still allows the aforementioned substitution effect but only to a limited extent. Consequently, the room to cheat customers via process capability evaluation shrank considerably. Last but not least, a further fine-tuning of C_{pm} brought yet another improvement in the form of the C_{pmk} index. The C_{pmk} shares the positive features of its predecessor, but is stricter in the sense that it punishes the process decentralization more severely. This index is frequently used, and we shall concentrate on its properties in the next section.

Let us now turn our attention to the assumptions under which the analysis will be carried out. First, as already suggested by the choice of the univariate index, the case of two-sided tolerance interval defined for the characteristic of interest will be scrutinized. Also, given the index, it is assumed that the quality characteristic, to be denoted X, is normally distributed: $X \sim N$. Further, it is assumed that the characteristic is contaminated by a variable Y which represents data contamination, mostly due to an imperfect measurement system. The consequence of this situation is the fact that whoever tries to calculate process capability with the selected index doesn't base its calculation on the true realizations of the variable X, but on the realizations of the random variable $Z = X + Y$. The usual *theoretical* model for the contamination variable is $Y \sim N(0, \sigma_Y^2)$ (Greene, 2011), but the exact normality will hardly ever, if ever at all, be the case. The zero expected value is usually assumed because very often there is a negligeable systematic shift in the measurement system due to the common practice that operators and other parts of the measurement system are varied during the application of the system and so any potential systematic shift is close to zero *in average*. What is often a natural and acceptable assumption, as well, is that the variables X, Y are independent. This condition implies that for the variance of Z, $var(Z)$, we have $var(Z) = var(X) + \sigma_Y^2 = \sigma_X^2 + \sigma_Y^2$, regardless of whether the contamination is normally distributed or not. To sum up, when it comes to the two major statistical characteristics of Z, its expected value and variance, we have:

$$E(Z) = E(X) + 0 = \mu, \tag{1}$$

$$var(Z) = \sigma_X^2 + \sigma_Y^2. \tag{2}$$

As is known from the statistical theory, should both X and Y be normally distributed, Z would also be normally distributed. However, as has been outlined, Y is usually normally distributed only approximately, which may result in Z not being normally distributed. If this is the case, a change in the distribution of Z might serve as a signal that data impurity is present.

4 ANALYSIS

In this section, we shall analyse the numerical behaviour of the selected capability index, the C_{pmk} index, which is defined as:

$$C_{pmk} = \min\left(\frac{USL-\mu}{3\sqrt{\sigma_X^2+(\mu-T)^2}}, \frac{\mu-LSL}{3\sqrt{\sigma_X^2+(\mu-T)^2}}\right). \tag{3}$$

This part follows up the previous section which suggested that if X was normally distributed, but Y was not, though it shared some features with normally distributed variables, then it might be the case that the variable Z would not be normally distributed. Such an event would be welcome because one could become suspicious that the data is contaminated, if the variable of interest X has always been quite precisely normally distributed, and all of a sudden it isn't. The analytical section of the paper scrutinizes whether this occurs or not, using techniques of simulation. Data is generated from the distribution $N(\mu, \sigma_X^2)$ for diverse enough values of the two parameters, specifically for $\mu = 1, 5, 10, 50$ and $\sigma_X^2 = 1, 5, 10, 50$. These figures represent, according to practical experience, small values 1 and 5, a medium value 10 and a larger value 50. Also, data from a distribution similar to the normal distribution were generated to represent realizations of the variable Y. To do so, the Student's t distribution with various degrees of freedom (diverse enough values k = 10 and k = 50 were selected) serves as a similar distribution. As is known, this distribution is symmetric around zero, the expected value of the variable with such a distribution (Forbes, et al., 2010). The symmetry envokes a similarity to the normal distribution, and the zero expected value is in line with the commonly accepted assumption that the data contamination due to measurement errors is zero in average. The data sample sizes generated for the various parameters of the two distributions were equal to 100. Once the data sets for both variables are generated, realizations of Z become available, and so it can be tested by standard statistical methods whether Z can be consider a normally distributed variable or not. Except for the t

distribution, other distributions similar to the normal distribution, at least regarding their symmetry, exist, as well. We considered specifically the lognormal distribution $lnN(\mu, \sigma^2)$ with parameters $\mu = 1$ or 3 and $\sigma^2 = 0.1$ or 0.2 (Forbes, et al., 2010). Such parameters ensure a high level of symmetry of the distribution. For the lognormal case, the normal parameters considered were $\mu =$ 10 or 50 and $\sigma_X^2 = 5$ or 50. The rest of the procedure was the same as in the case of the t distribution. In both cases, the chi-square test of normality at a 5% significance level was used.

Tab. 1 shows the results of the test with respect to the t-distrubion-based simulation of Y. The p-values of the test indicate that in all but three cases, denoted by " * ", the hypothesis of normality of Z is accepted. The p-values are in nearly all the cases greater than 0.05.

Table1 – Test of Normality of Z with t-distributed Contamination

μ	σ^2	k	*p-value*
1	1	10	0.59
1	1	50	0.46
1	1	200	0.75
1	5	10	0.12
1	5	50	0.05*
1	5	200	0.55
1	10	10	0.14
1	10	50	0.19
1	10	200	0.47
1	50	10	0.46
1	50	50	0.61
1	50	200	0.5
5	1	10	0.84
5	1	50	0.15
5	1	200	0.84
5	5	10	0.35
5	5	50	0.26
5	5	200	0.27
5	10	10	0.82
5	10	50	0.87
5	10	200	0.81

μ	σ^2	k	*p-value*
5	50	10	0.22
5	50	50	0.09
5	50	200	0.04*
10	1	10	0.88
10	1	50	0.23
10	1	200	0.29
10	5	10	0.22
10	5	50	0.85
10	5	200	0.08
10	10	10	0.82
10	10	50	0.74
10	10	200	0.3
10	50	10	0.5
10	50	50	0.9
10	50	200	0.9
50	1	10	0.65
50	1	50	0.85
50	1	200	0.28
50	5	10	0.22
50	5	50	0.32
50	5	200	0.33
50	10	10	0.21
50	10	50	0.55
50	10	200	0.02*
50	50	10	0.59
50	50	50	0.24
50	50	200	0.24

The following Tab. 2 shows the results of normality testing for the case when the contamination component is modelled with a lognormal distribution with the aforementioned parameters. It can be seen again that in all but one case the hypothesis of normality of Z is accepted. The results here are even more convincing.

Table 2 – Test of Normality with Lognormal Contamination

$(N)\ \mu$	$(N)\ \sigma^2$	$(LN)\ \mu$	$(LN)\ \sigma^2$	*p-value*
10	5	1	0.1	0.67
50	5	1	0.1	0.85
10	50	1	0.1	0.9
50	50	1	0.1	0.86
10	5	1	0.2	0.9
50	5	1	0.2	0.85
10	50	1	0.2	0.92
50	50	1	0.2	0.54
10	5	3	0.1	0.78
50	5	3	0.1	0.7
10	50	3	0.1	0.37
50	50	3	0.1	0.77
10	5	3	0.2	0.03*
50	5	3	0.2	0.14
10	50	3	0.2	0.86
50	50	3	0.2	0.09

We may conclude at this stage that as long as the contamination is not normally distributed, but its distribution has a symmetric shape with heavier or less heavy tails than the normal distribution, the data at hand – the realizations of the variable Z – will in most cases manifest themselves as if they were drawn from a normal distribution. This suggests that there is no way of recognizing the potential presence of data contamination in a majority of usual cases.

Since the problem of contamination cannot be recognized securely from the data, the question is whether there is a way of detecting it from the computed capability index itself, especially in cases when the index has changed from its long-term familiar level. To find this out, it is necessary to explore the mathematical behaviour of the index and its dependence on the extent to which the data contamination is present. This is going to be examined in this part of the paper. Before doing so, we shall make some assumption about the index, which nonetheless does not place any restrictions on the generality of the conclusions. First, it can hardly be expected that the process whose capability is calculated is perfectly centralized, so $\mu \neq T$ is expected with certainty. This is always the case in practice because whenever it seems that the process is centralized, it is centralized only seemingly due to the fact that all measurement systems are imperfect and cannot perform measurements with absolute precision. Further, as

long as the amount of decentralization towards USL or LSL is the same, the index will be the same, given (3). In this respect, the index behaves symmetrically, and so one can use either $(USL-\mu)/3\sqrt{\sigma_X^2+(\mu-T)^2}$ or $(\mu-LSL)/3\sqrt{\sigma_X^2+(\mu-T)^2}$ for the analysis. In other words, it is not going to make a difference if $USL-\mu$ or $\mu-LSL$ is considered for the analysis, when $USL-\mu=\mu-LSL$. We shall use the former case and assume $T<\mu<USL$. Next, although USL naturally affects the value of the index, we are more interested in general conclusions of the form „faster/slower drop/rise of the index" and not so much in its absolute change given by a *specific* number. This intention implies that the level of USL is not going to change such general conclusions and therefore can be set arbitrarily. To give an example of this statement, if one uses a level USL_1 and arrives at $C_{pmk}^{(1)}$, whereas someone else uses a level USL_2 and gets $C_{pmk}^{(2)}$, then $C_{pmk}^{(2)}=kC_{pmk}^{(1)}$, where $k=C_{pmk}^{(2)}/C_{pmk}^{(1)}$ is a positive constant. Now, if a change in $\sigma^2=\sigma_X^2$, say $\sigma_2^2-\sigma_1^2$, alters the index $C_{pmk}^{(1)}$ less than a change $\sigma_4^2-\sigma_3^2$, the same will be true about the change of $C_{pmk}^{(2)}$, because $\Delta C_{pmk}^{(2)}=k\Delta C_{pmk}^{(1)}$, and $k>0$ remains the same. To see the latter, compare the value of k, k_2, after the change of the variance,

$$k_2=\frac{(USL_2-\mu)/3\sqrt{\sigma_2^2+(\mu-T)^2}}{(USL_1-\mu)/3\sqrt{\sigma_2^2+(\mu-T)^2}}, \tag{4}$$

with its value k_1 before the change of the variance,

$$k_1=\frac{(USL_2-\mu)/3\sqrt{\sigma_1^2+(\mu-T)^2}}{(USL_1-\mu)/3\sqrt{\sigma_1^2+(\mu-T)^2}}. \tag{5}$$

We have $k_2/k_1=1$. Thus, the upper limit has no effect on the general conclusions. Finally, we are interested in the amount of process decentralization, among other things, i.e. in the difference $(\mu-T)^2$, not in T itself. In other words, the target value can also be set arbitrarily, as long as it stays in the middle of the tolerance interval, since it is the deviation from T, not T, that matters.

Let us now imagine that we are to evaluate the process by estimating the value of the expression $(USL-\mu)/3\sqrt{\sigma_X^2+(\mu-T)^2}$, but instead we estimate something else: the value $(USL-\mu)/3\sqrt{\sigma_X^2+\sigma_Y^2+(\mu-T)^2}$ because we work with realizations of the variable Z instead of X due to the presence of data contamination (see formulas (1) and (2)). The question is how the index reacts to a change in the amount of data contamination, the contamination being measured by σ_Y^2, given the current level of the process, defined by σ_X^2 and $(\mu-T)$. The answers are revealed by the concept of *rate of change.*

The rates of change of C_{pmk} with respect to σ_Y^2 are:

$$\frac{\partial C_{pmk}}{\partial \sigma_Y^2} = \frac{-(USL - \mu)}{6\sqrt{[\sigma_X^2 + \sigma_Y^2 + (\mu - T)^2]^3}}, \tag{6}$$

where USL and T are arbitrary constants and $T < \mu < USL$. Using the concept of marginal changes, the result implies that the index drops whenever data contamination enters the calculations, but the drop realizes to various extent depending on the original process capability before the drop due to contamination. Given μ, the drop due to contamination decreases when the original capability is lower in terms of a higher σ_X^2, and an analogous result applies for a given variability σ_X^2: the greater the amount of decentralization of the process, the smaller the drop of the index due to contamination. If it happens, however, that there is no contamination in the data, the question of what could have caused a drop in the index may still arise. Was it a greater process variability or greater decentralization? Of course, the answer to this question is fairly straightforward and is given by the formula defining the index. Based on the behaviour of the index implied by (6), it is now possible to make some conclusions regarding the use of the results just presented.

5 CONCLUSION

Let us make some final remarks about the consequencies implied by the behaviour of the C_{pmk}. Any chance of recognizing the situation, when the data is contaminated, by observing potential deviations in the probability distribution of the quality characteristic of interest from its normal distribution is next to zero. Data contamination, as we have seen, does not change the normal distribution in a majority of cases, if the stochastic behaviour of the contamination is modelled with the well-known symmetric or near-symmetric distributions – the t-distribution or the lognormal distribution. What the analysis does show, however, is that if the company using the index is used to high levels of process capability and records its drop, it is worth analysing its measurement system first before proceeding to dismantle the much more complicated production structure with all its production inputs and conditions. The index may have declined due to imprecise data instead, as at its higher levels it is more sensitive to data contamination. On the contrary, when the production capability tends to be low for a longer period of time, its further deterioration is most likely a result of production inefficiencies, not imprecise data. In that case, methods such as FMEA should be used. FMEA is good for "optimizing a product or process design from the perspective of potential failures" (Vykydal, et al., 2013). If no data contamination is found, and the index drops from a high level, it is more likely due to increased process variability, to which the index is more sensitive at its high levels, whereas a drop in the index from its lower levels may be due to increased decentralization rather than increased variability, provided the decentralization greater than one half can be expected. This is implied by the second power in the denominator of (3). The logic behind the discussion on

whether it is a greater decentralization or higher variability that worsened the process capability is such that when decentralization can be suspected of causing a drop in the index, it should be explored first, since if it is the case, it will usually be a result of a systematic problem in the process, which is much easier to detect and remove, as compared to detecting and lowering a process variability induced by a *myriad* of factors small in their effect.

Of course, when the measurement system requires an inspection, an upgrade of this management subsystem should be approached. By viewing this subsystem as a part of the ISO-based quality management system, one may, for instance, fine-tune it through role-play simulation techniques, which have the potential to better describe its functioning (Zgodavová, Kisela and Sutoová, 2016). By improving the measurement system, no more encumberance is put upon the entire system through an introduction of yet another variability. A reasonable approach may also include more sophisticated decision-making techniques, especially when several measurement systems are compared with respect to their quality, the comparison taking into account more than feature of theirs. Models, based on utility these measurement systems provide to their users, can then be analysed (see, Krajňák and Krzikallová, 2016, for the description of such models).

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Using of Performance Appraisal Methods in Czech and Slovak Organisations

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ABSTRACT

Purpose: People, their knowledge, abilities and skills are considered to be the most valuable source every organisation can exploit. It is, therefore, necessary to care about their fair remuneration and continuing development, as well as their objective and fair appraisal. Implementing an effective appraisal system in the personnel strategy, satisfying both employers and employees, is an essential part of the success of all competing organisations. The aim is to evaluate the use of employee appraisal methods in the selected Czech and Slovak organisations, and to recommend proposals for improvement on the grounds of such evaluation.

Methodology/Approach: The data were obtained in two quantitative researches conducted in the selected organisations in the Czech Republic (n = 402) and the Slovak Republic (n = 339). Univariate analysis, bivariate analysis and analysis of qualitative traits were employed in order to evaluate results.

Findings: The results showed that 58.46% of the interviewed Czech organisations and 69.32% of the Slovak organisations had established a formal system of employee appraisal. Most of them were medium-sized enterprises with an HR department, operating in the private sector.

Research Limitation/implication: Limits can be seen in to focus on research in two selected countries, but they have comparable from historical, political and the job market perspectives.

Originality/Value of paper: The article focused on using of modern performance appraisal methods in practice to build the employer's good brand and attract knowledge workers.

Category: Case study

Keywords: human resource management; performance appraisal methods; organisations; the Czech Republic; the Slovak Republic

1 INTRODUCTION

The main objective of performance appraisal is to ensure a maximum exploitation of the abilities, knowledge and interest of each employee (Arthur, 2010). It can therefore be assumed that a suitably set employee appraisal system has a significant impact on both their performance and performance of the whole organisation (Văcărescu Hobeanu, 2015). The employee performance appraisal can be considered to be a basis of making the exploitation of human resources in organisations more effective. Several authors have coincided that the performance appraisal aims at obtaining information and specifying the present level of employees, and especially at setting realistic objectives for further human resource management. A suitably elaborated employee appraisal system not only increases fairness, transparency and effectiveness in employee remuneration but it is also reflected in the correct establishment of employee education procedures, which results in an increased performance at work, as well as improved motivation to the quality of performed work (Lindner and Wald, 2011).

For this and many other reasons, every organisation should deal with the issue of employee appraisal and all related important factors. They, first of all, include the correct selection of methods and appraisal criteria, effective implementation of the appraisal system and purposeful setting of suitable objectives aimed at developing the whole organisation (El Baradei and Newcomer, 2008). The issue of appraisal methods and the whole work appraisal system is also relevant due to the fact that the development of information technology is accompanied by the breakthrough use of electronic environment as an instrument of continuous appraisal process. The employee performance appraisal is among the key problems that should be dealt with continuously by all employers in the present-day turbulent and competitive environment. Based on the knowledge and proper appraisal of employees, organisations can not only efficiently motivate employees but also ensure their fast and sustainable development (Yang and Zhu, 2008). Due to the fact that people have different knowledge, abilities and skills (Levy, 2011), the implementation of a corresponding and effective appraisal system is a necessary part of the success of organisations, and a fair system of the employee appraisal is necessary in order to retain the key employees and valuable information for further human resource management functions. It is obvious that there is no universal and ideal appraisal system in practice, as every organisation has its own specific needs and is affected by different factors (both external and internal). For this reason, this paper is to provide a complete picture of the important issue in human resource management.

The purpose of the paper is to evaluate the use of employee appraisal methods in the selected Czech and Slovak organisations, and to recommend proposals for improvement on the grounds of such evaluation. A partial objective is to examine dependence between the selected qualitative traits and to evaluate the present state of the given issue.

The first part of the article presents theoretical background together with comparisons of secondary resources. The chapter Results and Discussion includes an analysis and a synthesis of the survey targeted at the application of performance appraisal methods in the Czech and Slovak organisations and their comparison. The results of the survey are subsequently compared to the results of similar surveys conducted abroad, and draft recommendations are presented.

1.1 Theoretical Background of the Work

The employee appraisal is closely related to the concept of job performance, as it is an instrument of its management. Performance management is a systematic activity of managers aimed at achieving the corporate strategic objectives by means of achieving the required job performance (Văcărescu Hobeanu, 2015). Job performance is expressed by the quality of work, amount of work, approach to work, etc. The employee appraisal enables managers to achieve the required job performance and corporate strategic objectives by means of checking, guiding and encouraging employees during the performance of their work.

Three groups of employees participate in the implementation and development of an appraisal process. The first group includes the appraised employees (managers and employees to be appraised), the second group includes the appraising employees (both internal and external), and the third group includes so called facilitators (these are mostly the employees of departments of the management and development of human potential), whose role is to facilitate appraisal systems for the whole organisation (Blašková, 2011).

The employee appraisal can be both formal and informal in practice. In the informal appraisal, managers lead employees toward performing the agreed work, while monitoring and assessing their performance continuously. In an event of discrepancies between the actual and required performance, the manager and the employee need to specify a suitable improvement method immediately. The first step in solving a performance problem is to define the problem and identify its causes, which is a basis for decision-making regarding the steps leading to solving the given problem. It is further necessary that managers create conditions for successful problem solving, and that employees subsequently take the agreed steps. At the end, employees receive feedback from their managers in relation to the evaluation of the results of problem solving. Successful problem solving should be the common objective of both employees and managers. In contrast to the informal appraisal, formal appraisal, on which this paper is primarily focused, is performed by an appraisal interview, when managers inform employees, and discuss not only their performance but also their abilities, motivation and conditions with them (Hitka, et al., 2017). The aforementioned indicates that a suitably performed formal appraisal should provide a possibility to clarify the attitudes of both the appraised and appraising employees, taking into account that each of them can have a different apprehension and thus different measures of importance in appraising individual activities (Snell and

Bohlander, 2010). In this way, misunderstandings and uncertainties in the decisions of subordinates can be prevented and their proper understanding and performance by superiors can be ensured (Yang and Zhu, 2008). The outcome of the formal appraisal is a report (appraisal form), which is a part of personnel records, and which supports managers in their decisions concerning performance management.

Generally, the employee appraisal in organisations is regular and continuous, frequently supplemented by the special appraisal, which is irregular. With regard to the frequency of appraisals, appraisal types are divided into short-term, long-term and special. In the short-term appraisal, only performance is appraised, and the results are used for further long-term appraisal. It is a regular appraisal after several weeks of work with a focus on feedback and relationship between the appraised and appraising employees, typically conducted during or after the end of a trial period. The long-term appraisal should be conducted at least once in six months, i.e. it is also regular. Not only performance but also the competence of employees and their general approach to work are assessed. It is characterised by observing individual competences and tasks with regard to records on performances over a reporting period. Future development is forecast, and careers are planned and arranged by the employees and managers managing their further careers. For this reason, comprehensive information on appraisal criteria needs to be available for employees. On the basis of such comprehensive information on all attributes, responsibilities, values, standards, required behaviour and expected results, which will be a subject of appraisal, the employees can adapt their efforts to the appraisal criteria and achieve even above average results. The irregular special appraisal is applied in the situations when requirements for the competences of the appraised are not in line with the reality and expectations of employers.

The following three basic reasons why it is suitable to conduct the employee appraisal can be identified. They include increased performance, harmonisation of the interests of all participated parties and improvement of organisational structure. From the viewpoint of organisations, they predominantly include an impact on the increased performance of individuals, streamlined communication at individual levels of management and development of employee potential (El Baradei and Newcomer, 2008). By means of appraisals, managers are able to provide a fair performance assessment, to motivate and develop employees as well as to minimise their weaknesses. In employees´ terms, they have an opportunity to express their needs, goals and development demands, to receive feedback on their work and thus a motivation to further efforts (Kromrei, 2015).

It can be assumed that the employee appraisal methods help observe standard performance and behaviour, thus supporting the overall appraisal (Evans and Davis, 2015). There are a number of methods created in order to ensure an optimum employee appraisal (Kromrei, 2015), frequently distinguished depending on time. The first group concerns the appraisal focused on the past, i.e. on the already given performance. The second group concerns the future, i.e.

employee potential. According to Snell and Bohlander (2010), the most frequently used employee appraisal methods based on the examined groups include the methods focused on the past (management by specified objectives, comparison to standard performance, testing and observing of performance, appraisal questionnaire, rating scale, BARS method, the method of critical events, appraisal reports and employee comparison), and the methods focused on the future (self-appraisal (Chianchana and Wichian, 2016; Kromrei, 2015), Development Centre (El Baradei and Newcomer, 2008), 360 Degree Feedback (Hageman, et al., 2015), 540 Degree Feedback and mystery shopping, or mystery consumer (Wilson, 2001)).

With regard to the aforementioned, every appraisal system should satisfy the conditions of the same appraisal of individuals regardless of an appraiser, minimise the bias and mistakes of appraisers, and, first of all, it should measure the performance aspects which are substantial for the organisation. Further preconditions of effective appraisal include suitably established appraisal criteria and their principles (Văcărescu Hobeanu, 2015). However, proper implementation of an appraisal system needs to be underlined, taking into account that such a system might be implemented for up to 2 - 3 years. A longer time horizon is thus concerned, during which the implementation should proceed from top management toward executives (Diaz-Fernandez, Bornay-Barrachina and Lopez-Cabrales, 2015). A quality setting of the appraisal system can enable organisations to ensure the motivation and orientation of employees toward specified objectives, strengthened loyalty of the employees, feedback on performance as well as a basis for the remuneration and development of employees.

2 METHODOLOGY

Primary data were obtained from a quantitative research conducted in organisations operating in the Czech Republic in all sectors of the economy (based on the CZ-NACE). The research was conducted electronically from September 2015 to June 2016. The questionnaire was completed by mid-level and top managers of these organisations. The questions employed specialist terms generally known to mid-level and top management. For potentially ambiguous questions, terms were explicitly defined. The results are focused on the managerial aspects and marginally on the economic aspects. The survey comprised 12 questions and 4 identification questions on the performance appraisal methods. The formulation of questions resulted from co-operation with School of Economics and Management in Public Administration in Bratislava.

The total number of n = 402 organisations (774 organisations were addressed, the response rate was 51.90%) participated in the questionnaire research, which was conducted throughout all economic sectors in the Czech Republic in the monitored period from 1st September 2015 to 30th June 2016. The total number of n = 339 organisations (540 organisations were addressed, the response rate was

62.78%) participated in the research in the Slovak Republic. The organisations were selected exclusively for the purpose of the given survey and their composition is random, not respecting the precise shares in national economy. The questionnaire respected the ethical viewpoint and anonymity of respondents.

The structure of Czech organisations participating in the survey was as follows: the business sector: 70.65% private sector, 14.43% public sector, 14.93% state sector; the business field: primary 3.00%, secondary 27.10%, tertiary 69.90%; the market of operation of the given organisations: 12.19% local, 23.63% regional, 26.37% national, 37.81% international; the organisation is part of a multinational company: 50.00% yes, 50.00% no; the size of organisation: 50-249 of employees 65.92%, 250 or more employees 34.08%. The research concerned organisations with the assumed existence of an HR department, which is why the category of 50^{+} employees is significant for the research.

The structure of Slovak organisations participating in the research was as follows: the business sector: 70.06% private sector, 17.65% public sector, 5.29% state sector; the business field: primary 5.88%, secondary 33.53%, tertiary 60.59%; the market of operation of the given organisations: 8.37% local, 12.71% regional, 30.54% national, 47.88% international; the organisation is part of a multinational company: 59.00% yes, 41.00% no; the size of organisation: 50-249 of employees 67.85%, 250 or more employees 32.15%. The research concerned organisations with the assumed existence of an HR department, which is why the category of 50^{+} employees is significant for the research.

Closed or semi-open questions, which were compiled on the basis of the study of literature, documents and other related research, were used to obtain answers. In order to evaluate the results, descriptive statistical tools such as absolute and relative frequencies, dependence tests (χ^2 test) and tests of strength dependence (Cramer's V) were used (Anderson, 2009). If the p-value was lower than $\alpha = 0.05$, the null hypothesis was rejected. The scale according to De Vaus (2002) was used. Five basic null hypotheses were tested in both Slovakia and Czech Republic, discovering dependence between the selected qualitative traits. The following null hypotheses were tested:

- There is no statistical dependence between setting a formal employee appraisal system and the sector of operation of the interviewed Czech/Slovak organisations.
- There is no statistical dependence between setting a formal employee appraisal system and the size of the interviewed Czech/Slovak organisations.
- There is no statistical dependence between setting a formal employee appraisal system and the existence an HR department in the interviewed Czech/Slovak organisations.

- There is no statistical dependence between setting a formal employee appraisal system and the type of market on which the interviewed Czech/Slovak organisations operate.
- There is no statistical dependence between whether the interviewed Czech/Slovak organisations are a part of a larger group of institutions and setting a formal employee appraisal system.

To evaluate the data, the SPSS 23 statistical software and MS Excel 2010 were used.

3 RESULTS

The representatives of the interviewed Czech organisations declared that 58.46% (235) of organisations had established a formal employee appraisal system, and 41.54% (167) of them had not established it yet. The Slovak organisations declared that 69.32% (235) of organisations had established a formal employee appraisal system, and 30.68% (104) of them had not established it. In the Czech Republic, a formal appraisal system had been most frequently established by large organisations (48.51%) with more than 250 employees and with an HR department.

In the Slovak Republic, a formal appraisal system had been established by 80.73% of large organisations and 63.91% of medium organisations. Contingency tab. 1-5 show dependence between the existence of a formal employee appraisal system and individual selected qualitative traits (see Material and Methods).

Table 1 – Contingency Table of Dependence (Existence of a Formal Appraisal System x Sector)

Formal appraisal system	Czech Republic - sector			Total	Slovak Republic - sector			Total
	Private	State	Public		Private	State	Public	
Yes	157	43	35	**235**	182	13	40	**235**
No	127	17	23	**167**	79	7	18	**104**
Total	284	60	58	**402**	261	20	58	**339**

Tab. 1 showed that in the Czech and Slovak Republics, a formal appraisal system had been established by mostly private sector organisations (66.81% in the Czech Republic; 77.45% in the Slovak Republic).

Tab. 2 showed that in the Czech Republic, a formal appraisal system had been established by mostly medium-sized organisations (51.48%) as well as in the Slovak Republic (medium-sized organisations in 62.55%).

Table 2 – Contingency Table of Dependence (Existence of a Formal Appraisal System x Size of Organisation)

Formal appraisal system	Czech Republic - size		Total	Slovak Republic - size		Total
	50-249	250+		50-249	250+	
Yes	121	114	**235**	147	88	**235**
No	144	23	**167**	83	21	**104**
Total	265	137	**402**	230	109	**339**

Table 3 – Contingency Table of Dependence (Existence of a Formal Appraisal System x the Existence of an HR Department)

Formal appraisal system	Czech Republic - the existence of an HR department		Total	Slovak Republic - the existence of an HR department		Total
	Yes	No		Yes	No	
Yes	158	77	**235**	201	34	**235**
No	36	131	**167**	25	79	**104**
Total	194	208	**402**	226	113	**339**

Tab. 3 showed that in the Czech and Slovak Republics, a formal appraisal system had been established by mostly the organisations having an HR department, which helps the managing employees to set appraisal processes (67.23% in the Czech Republic; 85.53% in the Slovak Republic).

Table 4 – Contingency Table of Dependence (Existence of a Formal Appraisal System x Market)

Formal appraisal system	Czech Republic - market				Total	Slovak Republic - market				Total
	International	Local	National	Regional		International	Local	National	Regional	
Yes	106	23	64	42	**235**	94	23	77	41	**235**
No	46	26	42	53	**167**	12	27	30	35	**104**
Total	152	49	106	95	**402**	106	60	107	76	**339**

Tab. 4 showed that in the Czech and Slovak Republics, a formal appraisal system had been established by mostly the organisations operating on the global market (45.11% in the Czech Republic; 40% in the Slovak Republic).

Table 5 – Contingency Table of Dependence (Existence of a Formal Appraisal System x Part of a Group of Organisations)

Formal appraisal system	Czech Republic - part of a larger group of organisations		Total	Slovak Republic - part of a larger group of organisations		Total
	Yes	No		Yes	No	
Yes	149	86	**235**	136	99	**235**
No	52	115	**167**	41	63	**104**
Total	201	201	**402**	177	152	**339**

Tab. 5 showed that in the Czech and Slovak Republics, a formal appraisal system had been established by mostly the organisations being part of a larger group of organisations (63.40% in the Czech Republic; 57.87% in the Slovak Republic).

With regard to the obtained data, the following was discovered as a result of testing the statistical dependence:

- There is no statistical dependence between the sector of operation of the studied Czech/Slovak organisations and setting a formal employee appraisal system (p-value = 0.062; p-value = 0.971).
- Statistical dependence was discovered between the size of the interviewed Czech organisations and setting a formal employee appraisal system (p-value = 0.000, Cramer´s V = 0.423, significant dependence), however no dependence between the studied traits was recorded in Slovakia (p-value = 0.319).
- Statistical dependence was discovered between the existence of an HR department in the interviewed Czech organisations and setting a formal employee appraisal system (p-value = 0.000, Cramer´s V = 0.450, significant dependence), however no statistical dependence between the studied traits was recorded in Slovakia (p-value = 0.229).
- Statistical dependence was discovered between the market on which the interviewed Czech organisations operated and setting a formal employee appraisal system (p-value = 0.000, Cramer´s V = 0.216, low dependence), but no statistical dependence between the studied traits was recorded in Slovakia (p-value = 0.028); however, the theoretical frequency was not fulfilled, as 46.7% of the values were lower than 5).
- Statistical dependence was discovered between whether the interviewed Czech organisations were part of a larger group of institutions and setting a formal employee appraisal system (p-value = 0.000, Cramer´s V = 0.318, moderate dependence), but no dependence was recorded in Slovakia (p-value = 0.024); however, the theoretical frequency was not fulfilled, as 33.3% of the values were lower than 5).

Out of the hypotheses tested in the Czech Republic, 4 H0 were rejected, accepting alternative hypotheses, and 1 H0 was accepted, while all null hypotheses were accepted in the interviewed Slovak organisations. In the studied Czech organisations, this formal employee appraisal system was most frequently used for specialists (28.98%), followed by management (27.62%), administrative employees (26.71%), and manual workers (16.69%). In the studied Slovak organisations, the formal employee appraisal system was least frequently used for management (54.12%), with increasing figures for specialists (55.29%), administrative employees (57.65%) and manual workers (up to 62.65%). The survey was further focused on whose opinion was requested upon obtaining information in relation to employee appraisal. Detailed results compared to the Slovak Republic are provided in Tab. 6 (more than one answer could be indicated).

Table 6 – Sources of Obtaining Information in the Framework of Employee Appraisal

Opinion	**Czech Republic**		**Slovak Republic**	
	Absolute frequency	**Relative frequency**	**Absolute frequency**	**Relative frequency**
Direct superiors	229	46.54	167	51.38
Senior employees	71	14.43	66	20.31
Employees themselves	123	25.00	42	12.92
Subordinates	15	3.05	15	4.62
Colleagues	22	4.48	21	6.46
Customers	29	5.89	12	3.69
Other (not applied)	3	0.61	2	0.62

The methods of employee appraisal used by the organisations were further studied in the survey. The participating organisations which declared at the beginning of the survey that they had established a formal appraisal system (n = 235) could indicate more than one answer. The detailed answers of the interviewed Czech and Slovak organisations are provided in Tab. 7.

Table 7 – Using of Performance Appraisal Methods in the Czech and Slovak Organisations

Methods	Employee category in CZ				Employee category in SR			
	M %	S %	A %	W %	M %	S %	A %	W %
Appraisal based on complying with standards	13.45	13.60	15.87	26.76	12.73	15.47	15.83	31.73
Appraisal based on key events	14.27	13.17	10.10	9.30	8.42	5.08	6.11	4.17
Evaluation questionnaire	7.88	10.13	10.74	8.17	11.91	13.16	17.50	12.18
Observation	6.79	8.83	9.62	18.59	2.67	4.62	4.72	8.71
Appraisal interview	17.26	18.38	19.39	13.80	17.25	21.02	26.39	19.55
Self-appraisal	14.13	14.04	13.30	5.92	9.45	9.47	11.67	5.13
Management audit	2.71	1.45	0.95	0.56	9.24	3.70	1.94	0.96
Appraisal based on fulfilment of objectives	22.69	20.26	20.03	16.90	25.67	24.94	15.28	17.63
Development centre	0.82	0.14	0.00	0.00	2.67	2.54	0.27	0.00

The total of 93.62% of the participating Czech organisations having a formal appraisal system indicated that their employees were provided the results of the appraisal (regardless of the method of its execution), and were given an opportunity to comment on them, while 3.40% of the participating organisations indicated that their employees were made familiar with the appraisal results however without a possibility to comment on them. Employees were not made familiar with the appraisal results and had no possibility to comment on them in only 2.98% of the organisations. In the studied Slovak organisations, employees had a possibility to comment on their appraisal results in up to 75.2% of the organisations, they were made familiar with the appraisal results however without room for commenting on them in 11.6% of the organisations, and employees were not even made familiar with their appraisal results in 13.2% of the organisations. The results obtained from employee appraisals were subsequently used by the interviewed Czech organisations in the areas of remuneration (33.76% CZ; 43.85% SR), education and development of employees (24.76% CZ; 23.20% SR), personnel development or career growth (23.95% CZ; 19.37% SR), and personnel planning (17.53% CZ; 13.57% SR).

4 DISCUSSION

Based on the researches of El Baradei and Newcomer (2008), and Kromrei (2015), employee appraisal can be referred to as a comprehensive and difficult process. However, effective human resource management would not dispense with a functional employee appraisal system. The employee appraisal helps

organisations choose an employee suitable for the given position, identify and efficiently utilise the key competence of employees, motivate them and increase their motivation, provide feedback, tailor positions to the abilities of employees, and educate them properly. At the same time, appraisal systems are interconnected with other human resource management systems, such as remuneration and education. Appraisal systems would not be complete without these two components. A system is comprising strategic corporate objectives suitably interconnected with human resource management objectives, or suitably selected appraisal methods using suitably selected appraisal criteria in accordance with appraisal objectives, can be considered to be an effective appraisal system (Evans and Davis, 2015). It is important for every organisation to succeed in the modern globalised and competitive environment, which can be achieved through the quality performance of employees, which can be affected by the appraisal system (Diaz-Fernandez, Bornay-Barrachina and Lopez-Cabrales, 2015). The motivation-based approach is likely to be the most important of all the approaches to appraisal, as the whole appraisal is especially conducted because of the possibility to motivate performers more efficiently (Blašková, 2011). The appraisal itself also has a positive impact on the motivation of appraisers, as their motivation increases with realising the interconnection between the quality of their appraisal and the level of utilisation of the potential of appraised employees (Bernardin and Beatty, 1984).

With regard to the fact that employee appraisal reveals the actual level of the labour potential of a company along with the possibilities of its better exploitation, the analysis of the present state of performance appraisal clearly demonstrates that both Czech and Slovak organisations necessarily need to change their approaches in order to increase and better exploit the potential of their employees. The conviction of managers of the necessity to implement an effective formal employee appraisal process is a priority, with subsequent necessary correct choice of the appraisal criteria and methods, which can become an instrument of a line manager to regulate the behaviour and action of employees. On the basis of the results of the questionnaire research, bottlenecks which occurred in the organisations can be identified on the grounds of answers indicated by the interviewed Czech/Slovak organisations. The frequency of an appraisal process is concerned, when the appraisal frequency is more than two years, however employee appraisal on an annual, half year and even quarterly basis is more suitable in some industries. It is essential to realise that the frequency of appraisal should enable an appraisal process to provide a relevant answer to the performance and potential of each employee. The advantages of more frequent appraisal include the early recognition and subsequent solution of both work and personal problems, improved communication between employees and managers, and more frequent exchange of feedback. In terms of the rationality of the work of both a manager and employees, it is necessary to consider also the fact that each formalised appraisal process disrupts the continuity of business processes in a certain extent (Wong, 2009), which is why the length of an appraisal interview not exceeding an hour needs to be ensured.

Expenses related to the effective setting of a personnel process include time and financial units expendable for an interview as well as administrative costs related to the more frequent appraisal. The implementation of changes is a competence of HR departments, which present proposed changes to management, and individual managers inform their subordinates on the approved proposals.

It is further necessary in the effective appraisal process implementation in organisations to care about comprehensibility and to reduce the time involved, which can be practically ensured by e.g. introducing electronic appraisal forms; however information is confidential, and information security thus needs to be ensured in the information systems. By regular communication of the principle of appraisal interviews, appraisal criteria and news in this area from executives to subordinates, bottlenecks in the communication process can also be eliminated. Bottlenecks related to a lack of information can be eliminated by means of training in communication and management of employees, while it is suitable to hold such training always before initiating regular job interviews. Such training should be organised by HR departments and should be offered to all senior positions. The current trends in the area of appraisal include gamification, personal dashboard interconnected with analysis, graphs assessing advancement and performance (interconnection with the KPI - Key Performance Indicators) or other assessment metrics.

According to Snell and Bohlander (2010), it can be stated that employees are most frequently motivated by their organisations to higher performance by financial remuneration. It is therefore suitable to interconnect appraisal results with remuneration, i.e. to increase the awareness of the interconnection of an appraisal system with the system of education and remuneration in the organisation, which is also confirmed by Shih and Huang (2011). The research of Pardey and May (2014) demonstrated that the efficiency of financial bonuses could be increased by a clear explanation of the conditions of appraisal and of receiving such bonuses to employees. Last but not least, it is necessary to realise that the current trend in appraisal is to appraise whole teams, as the appraisal of both effectiveness and impact of individual teams makes the most sense to organisations, which is also confirmed by the researches of Chianchana and Wichian (2016). The appraisal of individual performances is less important than building a highly effective team nowadays.

5 CONCLUSION

Employee appraisal is an indispensable part of human resource management in every organisation, and its results are important not only for the management of the organisation but also for each of its employees. The applied appraisal methods have changed, and formal appraisal systems are not only based on completing an appraisal form any more. In the appraisal process, employees receive feedback on their performance and employers can plan the personal development of such employees as well as the team development on the grounds

of appraisal results. Every organisation needs to put emphasis on the method of executing and assessing appraisal as well as on how it will communicate its importance to both managers and employees. The results showed that the most frequently used method of employee appraisal is the appraisal interview and the least used method is the Development Centre. The total of 93.62% of the participating Czech organisations having a formal appraisal system indicated that their employees were provided the results of the appraisal (regardless of the method of its execution), and were given an opportunity to comment on them, while employees had an opportunity to comment on their appraisal results in 75.2% of Slovak organisations. No statistical dependence was recorded between the sector of the economy and setting a formal appraisal system in the interviewed Czech and Slovak organisations. It can therefore be assumed that the employee appraisal is an essential element in the private, public and state sectors of the economy. The practical contribution of the article is a presentation of the results of the survey conducted in the Czech and Slovak organisations, and identification of the appraisal methods most frequently used in relation to individual employee categories, including recommendations to improve the appraisal process. The theoretical contribution of the article is a comparison of the opinions of foreign authors on the given issue. With regard to the fact that the employee appraisal is a topical issue within human resource management, it would be suitable to focus further research on discovering a dependence between individual appraisal results and remuneration systems implemented in the organisations.

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Understanding Mobile Payment Service Continuous Use Intention: An Expectation - Confirmation Model and Inertia

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ABSTRACT

Purpose: With significant interest in mobile payment service(MPS), the amount of research on MPS has increased. However, prior studies have focused on users' first use adoption of MPS. Considering the length of time that has passed since MPSs were first introduced, it has become necessary to investigate usres' continuous use intentions of MPS. Therefore, in this research, we aim to verify which factors are influensive on continuous use intention of MPS.

Methodology/Approach: To achieve purpose, we adopt the expectation-confirmation model(ECM) and inertia. Also, we arranged our research in South Korea where has well developed market of MPS. We applied structural equation model to verify the hypothesis and conducted a survey on consumer who had an experiecne with MPS before.

Findings: The findings of this study highlight that importance of perceived usefulness. In this research, percieved usefulness have a significant effect on satisfaction and continuous use intention. Also, our findings emphasize the significant effect of inertia on the continuous use intention of an MPS. These findings have somethig in common with previous researches.

Research Limitation/implication: Because young user constitutes the majority of the respondents, generalizing the finding to individuals of all ages is difficult. Further, we only colledcted sample data form MPS usres in South Korea. Consumer perceptions and therir effects on intention may differ from culture to culture. The robustness of these results may be enhanced by replicating the study across various cultures and multiple consumer age groups. Also, because the previous study which is verifying effect of ECM on MPS is scant, theoretical basis seemed not that much robust. On this study, we struggle to build relationship adapting Inforamtion System (IS) context to MPS environment. On the further study, we expect additional reseraches which are using ECM on various IS environment.

Originality/Value of paper: This paper is an early research verfiying influencial factors on continuous use intention of MPS. This attempts and research of findings enable to offer timely advice to manager of MPS. Also, we struggle to apply concept of inertia to MPS environment to reflect more actual behavior of consumers.

Category: Research paper

Keywords: mobile payment service; expectation-confirmation model; inertia; continuous use intention; satisfaction

1 INTRODUCTION

With the rapid development of mobile technology, mobile services have increasingly become a part of our daily lives (Hwang, Shiau and Jan, 2007). In particular, forecasts of the growth of mobile payment services (MPSs) have been very positive. Attracted by the lucrative market and positive forecasts, service providers have released various MPSs. In particular, many global enterprises have focused on MPSs and implemented their own services (Schierz, Schilke and Wirtz 2010). For example, a leading mobile technology company, Samsung, has been trying to develop its own MPS, called Samsung Pay, and Apple has implemented an MPS called Apple Pay. With the significant increase in interest in MPSs within the marketing field, the amount of research on such services has increased dramatically. Since 1998, many papers related to MPS technology issues have been published, including more than 50 articles on consumers' adoption of MPS (Dahlberg, Guo and Ondrus, 2015). However, these studies have focused only on users' first use of an MPS. Given the length of time that has passed since MPSs were first introduced, as well as the intensely competitive market, with low switching costs for users, it has become necessary to investigate users' continuous use intentions of MPSs. To this end, we adopt the expectation-confirmation model (ECM) proposed by Bhattacherjee to demonstrate the status quo bias effect (Bhattacherjee, 2001b), adapting inertia as suggested by Polites and Karahanna as the theoretical base (Polites and Karahanna, 2012). The model and its variables have been verified in many other contexts of consumer behavior, particularly in the context of information systems (IS).

2 THEORETICAL BACKGROUND

2.1 Previous Researches on Mobile Payment Service

Research on MPS began soon after the first payment transactions in the mobile device environment in 1997. In the early phase of research, the main stream of research focused on technology issues. Once MPSs were more widely used, researchers started to concentrate on the consumer adoption of such services. As a result, during the past 10 years (2007-2016), a considerable number of articles

on consumer behavior with regard to MPSs have accumulated. In the initial stages of this period, researchers concentrated on identifying the factors that influenced users' first adoption of an MPS. Here, they wished to understand consumers' preferences and the reasons that consumers chose to use or not use an MPS. To do so, several models were proposed, including the technology acceptance model (Thominathan and Ramayah, 2013), the unified theory of acceptance and use of technology (Liu and Yi, 2017). However, these researches still remain on verifying the first use intentions of users of MPSs. During the past 10 years, the use of MPSs has spread tremendously, forming a significant market. Therefore, it has become necessary to identify and investigate those factors that influence users' continuous use intention of MPSs, a topic on which there is very little research. Thus, this study intends to fill this gap in the current body of research.

2.2 Expectation-Confirmation Theory

Introduced by Oliver in 1980, the expectation-confirmation theory (ECT) expresses consumer satisfaction as a function of expectation and expectancy disconfirmation. Using the ECT, Oliver argued that satisfaction affects consumers' attitude change and post-purchase intention (Oliver, 1980). The ECT has since been adapted and extended in consumer behavior and service marketing literature (Anderson and Sullivan, 1993). Then, in 2001, Bhattacherjee suggested an expectation-confirmation model (ECM) for IS continuance (see Fig. 1). Bhattacherjee argued that IS users' continuance decisions are similar to consumers' repurchase decisions because both are influenced by the initial use experience (of the IS or product), and such decisions are closely related to consumer satisfaction (Bhattacherjee, 2001b). Since this study, the ECM has been adapted to verify users' continuance intentions in an IS context. Lee adapted the ECM to verify the continuous use intention of an e-learning service by analyzing a sample of 363 learners for a web-based learning program (Lee, 2010). Kim identified the factors affecting the continuous use intention of a mobile data service (MDS) by analyzing 207 users who had prior experience with an MDS (Kim, 2010).

Figure 1 – Expectation-Confirmation Model

2.3 Status Quo Bias

In 1988, Samuelson and Zeckhauser demonstrated empirically why people decide to continue a current course of action rather than switching to a new course of action. They referred to this as the status quo bias (SQB), which they explained by adapting rational decision-making, cognitive misperception, and psychological commitment (Samuelson and Zeckhauser, 1988). SQB explained that people tend to make decisions by considering switching costs and benefits. However, even if the benefits of the new system outweigh the costs of switching, uncertainty about these benefits makes users stay with the incumbent system. 20years after the concept of SQB was established, several studies tried to adapt the SQB to the IS literature. Kim and Kankanhalli (2009) conducted a study on users' resistance to an IS implementation. They adapted the SQB theory to the technology acceptance literature by including variables related to three dimensions of the SQB: rational decision-making, cognitive misperception, and psychological commitment. In addition, Polites and Karahanna utilized the SQB in an IS context to verify how the use of an incumbent IS system negatively affects users' perceptions and usage intentions of a new system (see Fig. 2). They presented the concept of inertia as the persistent use of an incumbent IS system. In a general context, inertia is expressed "remaining at rest or in uniform motion in the same straight line unless acted upon by some external force" (Polites and Karahanna, 2012), and has been used traditionally in consumer behavior literature in the context of brand loyalty. Polites and Karahanna (2012) determined the mediating and moderating impact of inertia in an IS context.

3 HYPOTEHSIS

3.1 Expectation-Confirmation

As described in section 2.2, Bhattacherjee proposed the ECM in the context of IS continuance. Because the ECM verifies an individual's intention to continue using an IS, many studies have used the model in this context. The ECM has five main hypotheses, based on four variables: continuous use intention; the user's level of satisfaction with the IS; the extent of the user's confirmation of expectations; and perceived usefulness (Lee, 2010). Fig. 1 illustrates the ECM.

3.1.1 Satisfaction and Continuous Use Intention

The consumer satisfaction can be defined as a consumer's perception of the degree to which consumers requirements have been fulfilled (Horváth and Michalkova, 2012). With the definition of satisfaction, Keiningham, Perkins-Munn, and Evans verified that consumer satisfaction is influencial on consumer behavior patterns. Furthermore, they varified that high consumer satisfaction results in high consumer loyalty and greater re-purchase intentions (Keiningham, Perkins-Munn and Evans, 2003). In addition, marketing research has shown that

the major reason for a consumer's decision to re-purchase a product or re-use intention is his/her level of satisfaction (Anderson and Sullivan, 1993; Kotler and Armstrong, 2010; Fernandes and Pedroso, 2016). Bhattacherjee showed empirically that the level of satisfaction with an IS is a critical factor affecting the continuous use intention of a system (Bhattacherjee, 2001b). In line with previous research we therefore hypothesize that:

H1. User satisfaction positively influences a user's continuous use intention of an MPS.

3.1.2 Perceived Usefulness, Satisfaction and Continuous Use Intention

Perceived usefulness, in the initial phase, is defined as the extent of an individual's belief that the current system will increase task performance. As the concept of perceived usefulness has been adapted in the IS literature, many researchers have shown the importance of perceived usefulness to users' adoption intentions (Davis, Bagozzi and Warshaw, 1989; Taylor and Todd, 1995; Venkatesh and Davis, 2000). Since Bhattacherjee proposed the ECT, which is combined with the TAM, it has been verified that perceived usefulness affects not only the initial adoption of an IS, but also a user's satisfaction and continuous use intention. Many previous studies have identified the relationship between perceived usefulness, satisfaction, and continuous use intention (Liao, Chen and Yen, 2007; Lin, Wu and Tsai, 2005; Thong, Hong and Tam, 2006; Kang and Lee, 2015). In common with result of earlier studies, we expect positive effect of perceived usefulness on user satisfaction and continuous use intention. Therefore, we hypothesize that:

H2. Perceived usefulness positively influences a user satisfaction of an MPS.

H3. Perceived usefulness positively influences a user's continuous use intention of an MPS.

3.1.3 Confirmation, Perceived Usefulness and Satisfaction

The ECM posits that a user's confirmation of expectations will have a positive effect on the perceived usefulness of an IS and on user satisfaction (Bhattacherjee, 2001a). The expectation was initially introduced in 1932 by Tolman, and defined as "consumers' belief which is expecting attribute about product and service" (Tolman, Hall and Bretnall, 1932). Subsequently, Oliver adopted the concept of expectation in the marketing field. He proposed a model that expresses the building phases of consumer satisfaction. Using the model, he argued that satisfaction is built by the level of expectancy confirmation (Oliver, 1980). Referring to these prior studies, Bhattacherjee suggested a hypothesis on the relationship between confirmation and satisfaction. He also proposed a relationship between confirmation and perceived usefulness, supported by the theory of cognitive dissonance (Festinger, 1962), which proposes that users may experience cognitive dissonance or a psychological impact if their pre-acceptance usefulness perceptions are disconfirmed during actual use (Bhattacherjee,

2001b). In other words, he suggested that confirmation has a positive impact on the perceived usefulness of an IS. After these relations were confirmed, many studies identified a relationship between confirmation, perceived usefulness, and satisfaction of an IS in other product or service fields (Liao, Chen and Yen, 2007). We therefore hypothesize that:

H4. Confirmation positively influences a perceived usefulness of an MPS.

H5. Confirmation positively influences a satisfaction of an MPS.

3.2 Status Quo Bias

As we can see in Fig. 2, motives to continue using incumbent system which is affecting inertia divided two kinds of dimension: subconscious and conscious. Based on two different perspectives, our and prior research determined a variable which is representing subconscious motives as a habit and conscious motives as switching costs (Polites and Karahanna, 2012).

3.2.1 Inertia and Continuous Use Intention

Individual-level inertia is represented as an attachment to, and persistence of existing behavioral patterns, even if there are better alternatives or incentives to change. Thus, inertia is a rigid continuance of the status quo. In a consumption context, individual inertia refers to a fixed consumption pattern in which consumers are unconsciously attached to the same store of purchase or the same brand of products, based on past consumption experience (Oliver, 1999; Gulati, 1995). The main reason for this phenomenon is familiarity. To avoid the uncertainty associated with using a different store or brand, or the risks of switching costs, consumers prefer to maintain their existing behavior (Lin, Wu and Tsai, 2005; Kuo, Hu and Yang, 2013). To verify this phenomenon, previous researches adapted concept inertia to various contexts (Bawa, 1990; White and Yanamandram, 2004). Another study, which verified the effect of inertia in an IS context, defined inertia as a user's attachment to, and persistence in, using an incumbent system, even if there are better alternatives or incentives to change (Polites and Karahanna, 2012). This study further demonstrated the direct effect of inertia on the intention to use a new system (see Fig. 2). On our study, we also expect effect of inertia on the intention to use MPS. Thus, we hypothesize that:

H6. Inertia negatively influences a continuous use intention of an MPS.

3.2.2 Traditional Payment Habit and Inertia

Earlier researcher found that habit strength undermine the amount of information acquired which is regarding product or service and it utilized before a decision is made (Aarts, Verplanken and Knippenberg, 1998). So when a behavior is habit-driven, the person did not think much about it (Mittal, 1988). Habit is often confused with inertia in the literature. One researcher illustrated inertia in brand purchasing as "habituation" (Bawa, 1990), and Fredirck-son and Iaquinto

equated inertia, momentum, and habit (Fredrickson and Iaquinto, 1989). However, while habit may lead to inertia, the two constructs are clearly distinct. Inertia is a conscious choice to stay with the status quo even in the presence of better alternatives. But habit is referred to action which is automatically triggered by stimulus cues (Polites and Karahanna, 2012). After arranging the relationship between habit and inertia, Polites and Karahanna verified their cause-and-effect relationship. As we can see in Fig. 2, they try to elicit their relationship by using the variable "incumbent system habit" and "inertia". Through this verification, they intend to demonstrate an inhibiting role of habitual us of an incumbent system in technology acceptance (Polites and Karahanna, 2012). In this study, we defined incumbent system of MPS is a traditional payment method such as using credit card, paying in cash. Thus, we posit hypothesis that:

H7. A Traditional payment habit positively influences inertia.

3.2.3 Switching Cost and Inertia

Switching cost is defined as "the onetime financial costs and efforts that required customers who associate with the process of switching from one provider to another" (Burnham, Frels and Mahajan, 2003). Also, Samuelson and Zeckhauser argued that "switching cost means that the time and effort required to adapt to a new environment" and "These costs make a switch from the status quo much less likely to occur" (Samuelson and Zeckhauser, 1988). Based on this prior researches Polites and Karahanna (2012) verified the effect of switching costs on inertia. Thus, our study hypothesized that:

H8. Switching costs positively influence inertia.

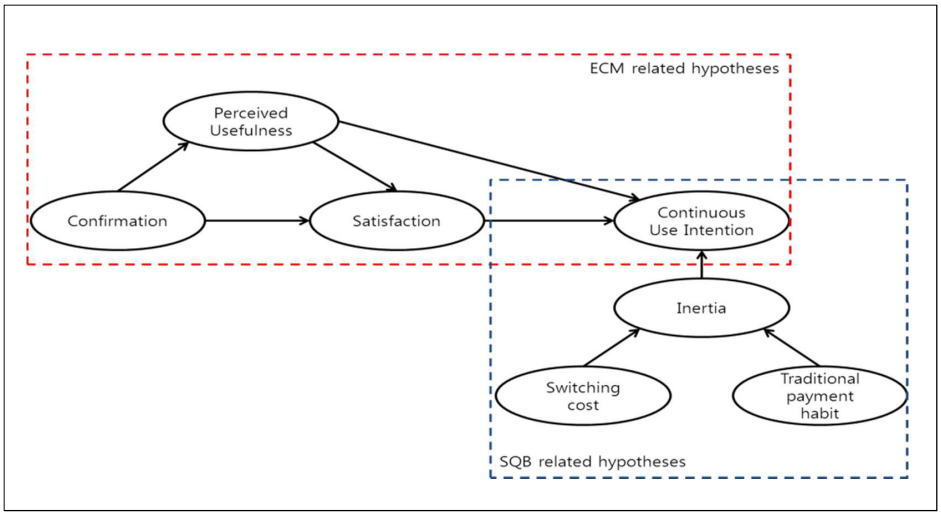

Figure 2 – Research Model

4 RESEARCH METHODOLOGY

4.1 Reseach Context & Survey Instrument

Our research context is set in South Korea, where the MPS market is flourished. South Korea is an appropriate environment in which to identify those factors that influence users' continuous use intentions for an MPS. All theoretical constructs in this study were assessed using multi-item questions. Respondents were asked to indicate the extent to which they agreed/disagreed with these items in relation to their experience of using MPS. Respondents rated each item on a scale of 1 to 5, where 5 represents "strongly agree" and 1 represents "strongly disagree." The survey was administered to a sample of 237 individuals who had previous experience of MPS. Because we wanted to gather data on consumers' perceptions of the important characteristics of an MPS, we eliminated the answers of individuals who lacked experience with an MPS. Of the 237 individuals contacted, 200 qualified for the final analysis.

Table 1 – Survey Instrument Items

Variables	Item	Content	Reference
Continuous use intention	INT1	If I could, I would like to continue my use of MPS	(Bhattacherjee, 2001b)
	INT2	All things considered, I expect to continue suing MPS during the next 4weeks	
	INT3	All things considered, it is likely that I will continue to use during the next 4weeks	
	INT4	I intend to use MPS on my future	
	INT5	I plan to use MPS on my future	
Satisfaction		How do you fell about your overall experience of MPS use:	(Bhattacherjee, 2001b)
	SAT1	Very dissatisfied/very satisfied	
	SAT2	Very displeased/very pleased	
	SAT3	Very frustrated/very contented	
Perceived Usefulness	PU1	Performance of MPS is of benefit to me	(Bhattacherjee, 2001b)
	PU2	The advantages of MPS outweigh the disadvantages	
	PU3	Overall, functions offered by MPS is advantageous	
Confirmation	CF1	My experience with using MPS was better than what I expected	(Bhattacherjee, 2001b)
	CF2	The benefit provided by MPS was better than what I expected	
	CF3	Overall, most of my expectations from using MPS were confirmed	
Inertia	INE1	I (will) continue retain my traditional payment method	(Polites and Karahanna, 2012)
	INE2	Because it would be stressful to change	

Variables	Item	Content	Reference
	INE3	Because it is part of my normal routine Even though I know it is not the best way of doing things	
Switching cost cost	SC1 SC2 SC3	Learning how to use MPS would take much time Becoming skillful at using MPS would not be easy for me I have already invested a lot of time in learning to use MPS	(Polites and Karahanna, 2012)
Traditional payment habit	HB1 HB2 HB3 HB4	Whenever I need to pay, I unconsciously use traditional method It would be difficult to control my tendency to use traditional wallet when I pay I do not need to devote a lot of mental effort to deciding that I will use traditional payment method Whenever I need to pay, I choose to use traditional payment method without even being aware of the choice	(Polites and Karahanna, 2012)

4.2 Sample

In June 2016, we conducted a web-based survey and a paper-based survey in South Korea. The characteristics of the respondents are shown in Tab. 2. We had a diverse sample of respondents, with approximately 86% between the ages of 20 and 29, and approximately 22% between the ages of 30 and 39. All of the survey respondents had experience of using an MPS in the previous six months.

We verified the level of non-response bias by comparing early and late respondents, in other words, those who replied during the first week and the last week. Based on the method proposed by a prior study (Armstrong and Overton, 1977), the t-tests for each case showed that the early and late respondents had no significant differences in terms of their gender, age, or occupation.

Table 2 – Demographic Characteristics of Sample

Classification		**Frequency (N = 200)**	**Percentage (%)**
Gender	Male Female	121 79	60.5 39.5
Age	20s 30s 40s	172 22 6	86 11 3
Occupation	Student Office worker Other	98 84 18	49 42 9

Classification		Frequency (N = 200)	Percentage (%)
Experience in past six months	Less than 5 times	20	10
	5–10 times	61	30.5
	10–20 times	73	36.5
	More than 20 times	46	23
Main usage	Payment	88	44
	Discount coupon	53	26.5
	Loyalty point	46	23
	Other	13	6.5

5 DATA ANALYSIS AND RESULTS

A data analysis was conducted using the structural equation modelling technique of partial least squares (PLS), with SmartPLS 2.0. The PLS technique is primarily intended for causal-predictive analyses in highly complex situations (Cho and Jang, 2017). Additionally, the PLS technique is not as restrictive as multivariate normal data distributions are, and the scales may be ordinal. We first checked the validity of the measurement instrument and then tested the hypotheses (Jöreskog and Sörbom, 1989).

5.1 Measurement Model

To demonstrate the instruments conceptually, five innovation management researchers and three MPS experts examined the measurement items and reviewed their face validity. We further examined the constructs for convergent and discriminant validity. Convergent validity can be assessed using the following criteria: (1) the factor loadings of the survey items should be significant and exceed 0.7; (2) the composite reliability (CR) and Cronbach's alpha should exceed 0.7; and (3) the average variance extracted (AVE) of the constructs should exceed 0.5 (Fornell and Larcker, 1981; Gefen, Straub and Boudreau, 2000). As shown in Tab. 3, the standardized path loadings of all survey items are significant (t values > 1.96) and larger than 0.7. Furthermore, the CR and Cronbach's alpha for all constructs exceeded 0.7, and the AVE for each construct was larger than 0.5. Therefore, the measures show good convergent validity.

Table 3 – Convergent validity

Variables	Factor Loadings	AVE	CR	Cronbach's α
INT	0.867, 0.874, 0.907, 0.869, 0.884	0.775	0.945	0.927
SAT	0.891, 0.909, 0.899	0.809	0.927	0.883
PU	0.897, 0.895, 0.861	0.782	0.915	0.860
CF	0.882, 0.903, 0.863	0.779	0.914	0.859

Variables	Factor Loadings	AVE	CR	Cronbach's α
INE	0.835, 0.937, 0.896	0.793	0.919	0.868
SC	0.886, 0.899, 0.809	0.749	0.899	0.832
HB	0.870, 0.911, 0.883, 0.920	0.803	0.942	0.918

Note: INT: Continuous use intention, SAT: Satisfaction, PU: Perceived usefulness, CF: Confirmation, INE: Inertia, SC: Switching cost, HB: Habit

Discriminant validity is estimated using the method suggested by Fornell and Larcker (Fornell and Larcker, 1981), in which the square root of the AVE for each construct should exceed the correlation between it and any other constructs. Table 4 shows the correlation matrix, with the correlations among the constructs and the square root of AVE shown in the diagonal elements. The diagonal values exceed the interconstruct correlations. Hence, the result of the discriminant validity test is acceptable.

Table 4 – Discriminant Validity

	INT	SAT	PU	CF	INE	TC	HB
INT	0.880						
SAT	0.262	0.899					
PU	0.706	0.348	0.884				
CF	0.635	0.289	0.733	0.883			
INE	-0.227	-0.316	-0.108	-0.038	0.890		
SC	-0.443	-0.003	-0.444	-0.406	0.337	0.866	
HB	0.078	-0.294	0.085	0.101	0.571	0.571	0.896

Note: INT: Continuous use intention, SAT: Satisfaction, PU: Perceived usefulness, CF: Confirmation, INE: Inertia, SC: Switching cost, HB: Habit

After testing the measures of the model, we checked for possible common method variance (CMV). Harman's single-factor test examines whether a single factor accounts for a majority of the variance in the data (Podsakoff, et al., 2003). A principal component analysis with eigenvalues larger than one is used to extract the factors. The analysis results showed that CMV is not a serious problem in this study.

5.2 Structural model

We tested the hypotheses using the PLS technique. Figure 4 shows the results of the PLS structural model assessment, including the overall explanatory power and estimated path coefficients. The tests of the significance of all paths were performed using the bootstrap resampling procedure.

Perceived usefulness (β = 0.700) has a significant influence on the continuous use intention at p < 0.01. Thus, H2 is supported. In addition, perceived usefulness (β = 0.295) affects satisfaction (p < 0.05). Thus, H3 is supported. Confirmation (β = 0.733) has a significant influence on perceived usefulness (p < 0.01). Thus, H4 is supported. However, the path coefficients of satisfaction were statistically insignificant for continuous use intention, and the path coefficients of confirmation were statistically insignificant for satisfaction. Thus, H1 and H5 are not supported. Inertia (β = -0.163) has a significant influence on the continuous use intention and Switching cost (β = 0.318) and the traditional payment habit (β = 0.560) has a significant influence on inertia. Thus, H6, H7, and H8 are supported. The explanatory power (R^2) of perceived usefulness (0.537), satisfaction (0.124), continuous use intention (0.523), and inertia (0.427) are larger than the required threshold of 0.10 (Falk and Miller, 1992).

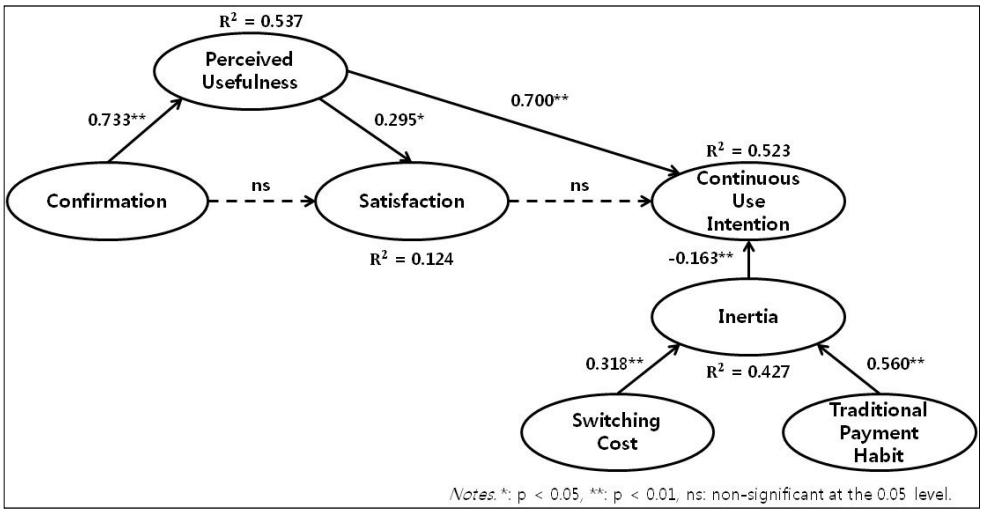

Figure 3 – Results of the Hypothesis Tests

6 CONCLUSIONS, LIMITATIONS, AND FUTHER RESEARCH

This study was conducted in South Korea, a country with many MPS users, in order to identify the variables that influence users' continuous use intentions.

First, we focused on the importance of perceived usefulness. As discussed in section 2.2, many studies have been conducted in the context of the continued use of IS, verifying the effect of perceived usefulness and satisfaction on continuous use intentions. Most of these studies reveal that both perceived usefulness and satisfaction are influential. However, in our study, the effect of satisfaction was found not to be significant because the mediating effect of perceived usefulness is too large. We interpret this result as follows.

Considering the characteristics of an MPS, it is possible for several payment services to co-exist in one smart devices (ex, smart phone, tablet PC). More

specifically, because MPS functions vary, or even if they offer the same functions, their usability differs. Therefore, users are indifferent overall in terms of the total satisfaction provided by a single MPS, but they are interested in the individual functions of MPSs and their perceived usefulness, which is expressed as the extent of an individual's belief that the current system will increase task performance. From an academic perspective, this study adapted and extended the traditional variables of IS continuous use intention to an MPS context. However, our findings differ from those of previous studies. Our results emphasize the importance of perceived usefulness in our context, which requires further research in similar environments, such as money-related mobile applications. In addition, our results can be helpful for MPS companies and their managers. As discussed above, MPS users are strongly affected by perceived usefulness. Therefore, managers and companies have to intensify the ability and performance of an MPS rather than concentrate on overall satisfaction. Furthermore, in order to increase their usage rate in the MPS market, their systems should offer functions offered by other MPSs. This means that concentrating on one particular function is essential. However, at the same time, they should offer other functions that are the same or better as those of other MPSs.

Second, our findings emphasize the significant effect of inertia on the continuous use intention of an MPS. Even if users feel their expectations are confirmed and that the system is useful, inertia will still have a negative influence on their continuous use intention. Furthermore, switching costs and traditional payment habits have a significant effect on inertia. This appears to be similar to the findings of previous studies that examine the role of inertia on consumer behavior in IS (Polites and Karahanna, 2012). These studies demonstrate the effect of a traditional payment habit and familiarity on the continuous use of an IS, and argue that prior system use and habitual behaviors have a negative effect on their continuance intention (Wilson and Lankton, 2013; Limayem and Cheung, 2008). Considering these previous results and our findings, if organizations wish to reduce inertia, they should consider habit disruption and reformation. In order to do so, it is necessary that people have experience using an MPS, which will help to detach them from the familiarity of using traditional payment methods. Thus, simply explaining the advantages and strengths of an MPS is not effective. Instead, the MPS manager should consider events or exhibitions that let people use an MPS directly. In addition, it is important that these events are held regularly and that they introduce new functions and improvements to the MPS. Increasing the inertia of using the MPS will lead to sustainable continuance.

Despite the significant practical and theoretical implications, our study has limitation because the previous study which is verifying effect of ECM on mobile payment service is scant, theoretical basis seemed not that much robust. On this study, we struggle to build relationship adapting IS context to MPS environment. On the further study, we expect additional researches which are using ECM on various other IS environments.

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What Factors Affect to Curation Commerce Website Loyalty Intention: The Mediating Effects of Perceived Deception

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ABSTRACT

Purpose: As the importance of information quality has become prominent in the internet commerce, curation techniques are also stands out as well. Therefore, many services on e-commerce applied with curation techniques to satisfy their consumers. However, besides the fact that plenty of advantages from curation commerce, the growth of curation commerce websites have been slowdown. Thus, this paper is to investigate factors influencing curatiaxon commerce websites' consumer loyalty intentions for enhancing the competitiveness of curation commerce websites.

Methodology/Approach: This study sets independent variables regarding provider recommendation and consumer review simultaneously and verifies to see how each factors affect to consumer's loyalty intention through perceived deception and satisfaction in the curation commerce website. We applied structural equation model to verify the hypothesis and conduted a survey on consumer who had buying expriences in Korean curation commerce website.

Findings: The results of this study show what fators significantly affect to loyalty intention. Consumers on curation commerce mostly tend to be affected by other consumers' review and they only affected by presentation of product among provider recommedations. We conducted an important mediating effect of satisfaction between perceived deception and loyalty intention. Furthermore, because curation commerce is a relatively new concept, this attempt could form the basis for research on cuartion commerce.

Research Limitation/implication: This research only collected sample data form curation commerce websites users in Korea and because young consumers onsistute the majority of the respondednts, generalizing the findings to individuals of all ages and nations is difficult.

Originality/Value of paper: This paper is the first study applying product recommendation and consumer review simultaneouly as an independent variable. These attempts enable to reflect more specific and practical behavior of consumers. Effect of satisfaction on loyalty and relationship between deception and loyalty are well documented in the offline and online retail context. This study expands and verifies estabilshed relationship among the variables on the lastest commerce website.

Category: Research paper

Keywords: loyalty; perceived deception; provider recommendation; consumer review; curation commerce

1 INTRODUCTION

The practical use of the Internet for commerce is continuously growing, and the number of online shopping use is tremendously increasing each year. However, unfortunately, deceptive information in the e-commerce market continues to increase. Consequently, the question arises regarding how to obtain the precise information that consumers need. One of the possible solution considered is "curation". Consumers obtain tremendous product/service information that can meet their demands in commerce. However, they cannot verify if this information is accurate and true. In this case, curation collects valuable and trustworthy information from the massive volume of related data and offers verified product/service information that matches consumers' needs (Tan, 2007). The usefulness of curation leads to its application in numerous fields. In South Korea, companies have developed and applied concpet of curation to commerce. However, the market has yet to reach the expected level. Therefore, many curation commerce websites face difficulties in achieving sustainability. To strengthen competitiveness of lastest e-commerce website, we focused on quality of information on e-commerce website. Because previous research has shown that the information on an e-commerce website and shared between provider and consumer is considered one of the most important aspects of enhancing the website's competitiveness and guaranteeing its sustainability (Klein, 1998; Lynch Jr and Ariely, 2000). In this research, we define provider recommendation (PR) content as the most important content that sellers give to consumers and define consumer review (CR) content as the most effective information content shared by consumers. We verify the characteristics of PR content and CR content that affect the consumer loyalty intention. Through this analysis of effects, we suggest a strategy to increase the competitiveness of a curation commerce website and to create actual purchase demand from consumers' potential demand.

2 THEORETICAL BACKGROUND

2.1 B2C Websites and Curation Commerce Website

Many prior papers focus on reporting the status of B2C e-commerce websites (Ho, 1997; Dorčák, Štrach and Pollák, 2015), predicting future trends, and providing guidelines for managing B2C websites (Gogan, 1996; Morris and Hinrichs, 1996). Each B2C website had a different way to serve and sort the information on its products and services. The key characteristics of a B2C website are revealed along the lines of its design and content. To satisfy consumers and sell goods, B2C websites provide information in various ways and create diverse e-commerce markets. As an example of a recent e-commerce type, one B2C website adds a social network aspect. Social commerce refers to the use of e-commerce activities and transactions through a social media environment, in particular in social networks using Web 2.0 software. Thus, social commerce can be considered a subset of e-commerce that includes using social media to assist in user content contributions (Liang and Turban, 2011). New B2C websites such as social commerce, provide a variety of content and value that old websites cannot. Given the advent of various B2C websites that have new aspects and an increasing number of consumers using them, the amount of data stored electronically has become excessive. Moreover, accessible data on the Internet continue to grow at an enormous pace. This trend will not only continue but also accelerate in the future (Ramírez, 2011). As a result, the problem is how to search for the best choice among the enormous volume of information. Thus, search has been an essential tool for selecting suitable information (Brin, 1998). Providing accurate information in a better manner than search tools do has become necessary. In these states, a curation service, in many cases, can provide assured information that has been quality checked and is relevant to specific areas (Tan, 2007). Using these advantages, e-coomerce has recently begun to be applied to th concept of curation. Because this is the most advanced form of e-commerce, we set up curation commerce websites as subject of research.

2.2 S-O-R Theory

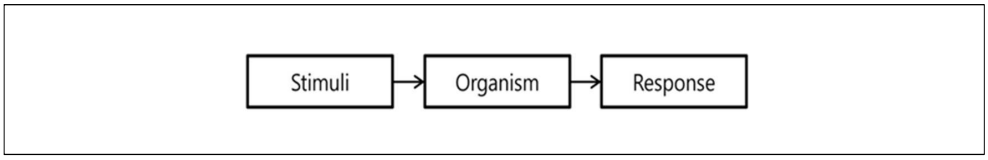

Figure 1 – Conceptual Framework

The research framework of this study is based on the S-O-R paradigm, which is generally used in studies in both the traditional and e-commerce marketing fields. Using this paradigm, prior studies verify a relationship between the store

environment and consumer cognition. They indicate ambient factors, design factors, and social factors as a store environment that provides stimuli and defines merchandise and service quality as inferences that explain the organism. Lastly, they establish the store image to indicate cognition as a mean response (Baker, Grewal and Parasuraman, 1994). Additionally, Chang and Chen confirm the impact of cues in the online store environment on purchase intention using the S-O-R paradigm. They define website quality and brand as stimuli, assign trust and perceived risk as organism, and assign purchase intention as response (Chang and Chen, 2008). Considering prior research, the conceptualization of stimuli - explained as something that arouses or incites to action - has been used and accepted in the literature (Bagozzi, 1986). In a consumer decision-making context, the stimuli can be conceptualized as the external factors associated with a pending decision (Bagozzi, 1986). Thus, the stimuli are represented by various store atmosphere factors or website characteristics. Additionally, the stimuli are expected to influence a consumer's perceived feeling when shopping (Sherman, Mathur and Smith, 1997). In this research, we consider stimuli as variables related to the characteristics of the information content. Organism refers to the internal processes between the stimuli to the person's final actions, reactions, or responses. Note that the intervening structures consist of perceptual, physiological, feeling, and thinking activities (Bagozzi, 1986). Consistent with this definition, the emotional state is conceptualized as the organismic variable. In preceding studies, researchers have defined organism variables that have positive effects on consumer behavior. In this research, we focus on perceived deception as the organism. Bagozzi defines response as the outcome or final action or reaction of consumers, including psychological reactions such as attitudes and/or behavior (Bagozzi, 1986). Moreover, these attitudes and/or behavioral reactions are affected by a consumer's emotional state. Thus, in this study, we set consumer satisfaction and consumer loyalty intentions as response variables.

2.3 Perceived Deception

In the traditional marketing field, deception is perceived as having special interest in the areas of advertising and personal retailing. In the context of marketing practices, deception is defined as unethical and unfair information to the deceived (Aditya, 2001). Preceding research in the retailing and personal selling context identifies deception as exaggerating product features and selling items using high-pressure selling techniques. Such research also implies that deceptive selling actions are found to decrease consumer satisfaction and trust (Ingram, Skinner and Taylor, 2005; Román and Ruiz, 2005). Additionally, few researchers concentrate on deception in e-commerce. One study conducted by Roman developed a scale to measure consumers' perceptions regarding the ethics of online retailers (CPEOR). His findings indicated that the CPEOR scale had four dimensions: security, privacy, non-deception, and fulfillment/reliability (Roman, 2007). Recently, Sergio Román represents the direct effect of perceived

deception toward consumer satisfaction and consumer loyalty intentions in online retailing. He finds that perceived deception negatively affects consumer satisfaction and represents that consumer satisfaction positively affects consumer loyalty intentions. However, perceived deception has no effect on consumer loyalty intentions (Román, 2010).

3 HYPOTEHSIS

3.1 Argument Strength

Argument strength is referred as the quality of the received information (Cacioppo, et al., 1983) and is the extent to which people perceive the argument of a received message as convincing or valid in supporting an opinion. The previous studu verifies that argument strength directly affects the receiver's attitude in online environments (Cacioppo, Petty and Morris, 1983). If the received information is perceived as a valid argument, the receiver adopts a positive attitude toward the information and considers it credible. Conversely, if the received information is cognized as invalid, the receiver adopts a negative attitude toward the information and treats it as deceptive (Cheung, et al., 2009). Additionally, prior studies demonstrate the effect of argument strength on perceived value in both physical communication and computer-mediated communication contexts (Bunker, 1994; Nabi and Hendriks, 2003). According to prior studies, argument strength proves to be an important element that individuals use to evaluate incoming communications. Particularly in a curation website environment, providers and consumers communicate through arguments on the website. Therefore, most consumers primarily depend on provider and consumer opinions of products or services and judge the deception in online websites based on the argument strength of PR and CR.

H1a: PR argument strength has a negative effect on perceived deception.

H1b: CR argument strength has a negative effect on perceived deception.

3.2 Sidedness

Research in the marketing field has been interested in the attitudinal effects of one-sided vs. two-sided messages in word-of-mouth communications. The one-sided message represents either the positive or the negative side of the product or service. In contrast, a two-sided message contains both positive and negative elements (Cho, 1995). Regarding the consumer's position, every product or service has its strengths and weaknesses. Receiving information on both strengths and weaknesses enhances the credibility and quality of that information. Hence, two-sided information tends to be perceived as more credible and reduces the deception in information (Smith and Hunt, 1978). Prior study proves that two-sided product information is more persuasive than only positive information (Allen, 1993). Previous research state that two-sided

information reduces the information receiver's skepticism and deception; therefore, it may intensify the credibility of the information (Belch, 1981). Particularly, in a curation commerce website, the effect of information sidedness is addressed with more sensitivity. Products or services in a curation commerce website are mostly unfamiliar to consumers. Therefore, when consumers visit such websites, they depend completely on the provider's recommendations and consumers' reviews, along with their own experience, to evaluate the goods. Thus, PR and CR content that objectively use two-sided words reduce the deceptive nature of the website.

H2a: PR sidedness has a negative effect on perceived deception.

H2b: CR sidedness has a negative effect on perceived deception.

3.3 Product Presentation

In the marketing field, the visual presentation of goods may create an emotional response during purchases (Swinyard, 1993). For example, an appealing visual presentation of goods may accelerate consumers' intention to purchase (Then and DeLong, 1999). Thus, product displays at the store are directly related to sales. Particularly in e-commerce, this point is more important in providing adequate visual information to consumers because consumers should rely on what they have seen on screen when purchasing goods. Then and DeLong verified that visual presentation can provide product information that is known to affect consumer purchase intentions regarding online sales (Then and DeLong, 1999). Additionally, different aspects of previous research exist. If the visual information of goods is not attractive enough to make judgments regarding the goods, perceive risk or other negative cognitions increase, causing consumers to avoid purchasing the goods from the Internet (Park, Lennon and Stoel, 2005). In curation commerce, consumers are surely concerned about the product presentation of the provider. Moreover, consumers have recently also referred to other consumers' product presentation. Thus, a product presentation of high quality decreases the deception of the website.

H3a: PR product presentation has a negative effect on perceived deception.

H3b: CR product presentation has a negative effect on perceived deception.

3.4 Perceived Deception

To suggest the effect of deception on satisfaction, this study adopts the expectancy disconfirmation paradigm (Oliver and DeSarbo, 1988). This theory holds that consumers make comparisons between product expectations and performance that result in either acceptance or rejection. Consumers' expectations are satisfied when product performance exactly meets these expectations. In contrast, disconfirmation is the result of a discrepancy between expectations and performance. Positive disconfirmation occurs when product performance exceeds prior expectations, and negative disconfirmation occurs

when performance does not meet expectations. Confirmation and positive disconfirmation are likely to lead to satisfaction, whereas negative disconfirmation cause dissatisfaction. Consumer expectations regarding the goods are highly dependent on the information content uploaded onto the website. An online information provider that implements deceptive techniques is more likely to exaggerate unrealistic expectations about the goods, which may result in negative disconfirmation in expectations and product performance and may lead to consumer dissatisfaction of the website. Prior research in e-commerce settings provides empirical evidence for the negative effect of deceptive feelings about a website on consumer satisfaction (Román, 2010). In this study, we expand the analysis to curation commerce settings.

H4: Perceived deception has a negative effect on consumer satisfaction.

Loyalty intentions can be adopted using equity theory (Adams, 1963). One study based on equity theory indicates that consumers often evaluate marketplace transactions by considering how equitably each group has contributed to an exchange in traditional commerce (Huppertz, Arenson and Evans, 1978). In particular, equity theory argues that if one group of consumers recognizes an unfair benefit, the disadvantaged group views the situation as inequitable and intends to achieve a balance or restore equilibrium. Therefore, if consumers perceive providers' attempts at deception, they feel inequitable, causing negative effects on loyalty intentions. Early research in offline retail settings links consumers' perceptions of deceptive practices to loyalty (Whalen, Pitts and Wong, 1991). Only a recent study verifies the relationship between perceived deception and loyalty intentions in online retail settings.

H5: Perceived deception has a negative effect on consumer loyalty intention.

3.5 Consumer Satisfaction and Loyalty Intentions

Prior research regarding consumer loyalty, Consumer satisfaction and the positive effect of satisfaction on loyalty has been well documented in the offline retail context (Ingram, Skinner and Taylor, 2005; Vykydal, Halfarová and Nenadál, 2013; Horváth and Michalkova, 2012). Recently, this relationship also has been verified in the online environment (Fassnacht and Köse, 2007; Román, 2010) and could be explained by the fact that consumers who are satisfied by high value goods are more likely to be loyal to the company. Therefore, they tend to purchase goods from that company in the future and behave in a manner that is beneficial to the company through writing positive CR, spreading positive word-of-mouth, and/or posting positive electronic word-of-mouse through social network services. Thus, we expect that satisfaction with an online retailer will increase loyalty intentions.

H6: Consumer satisfaction has a positive effect on consumer loyalty intentions.

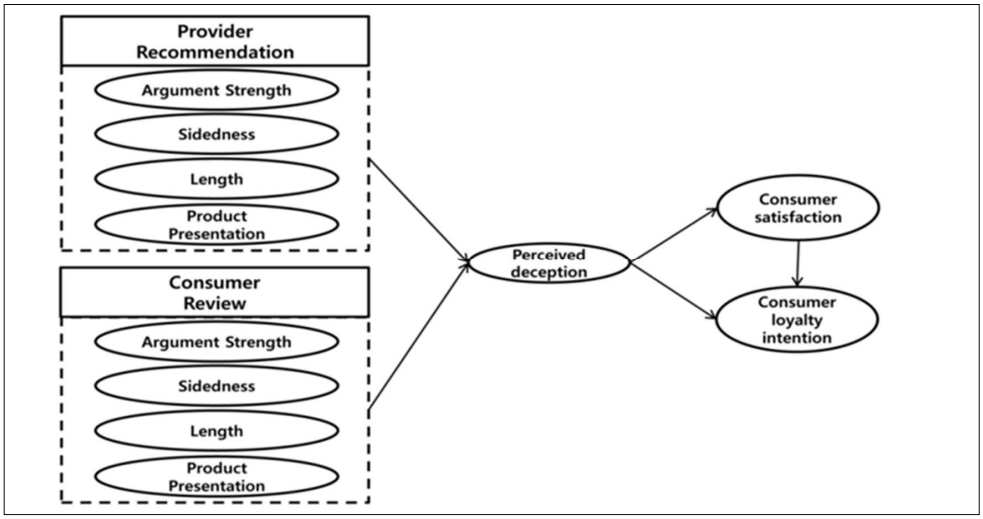

Figure 2 – Research Framework

4 RESEARCH METHODOLOGY

4.1 Survey Instrument

The attributes were summarized into multiple items and a survey instrument was created. This instrument asked respondents to investigate the extent to which they agreed/disagreed with these items in relation to their shopping experiences with curation commerce websites. Respondents rated each item on a scale of 1-5, where 5 represented "strongly agree" and 1 represented "strongly disagree." In addition, we collected demographic data from the respondents, including information on their experiences with a number of online purchases on the curation commerce website in the last six months, the product family (search products vs. experiential products) of their purchases, and the amount of money spent on curation commerce website purchases. The survey instrument was pilot tested with 5 doctoral candidate students and 15 others who had prior experience with the online curation commerce website. We also considered expert opinions. The experts consisted of the curation commerce website's CEO, manager, and technician. We shared our survey instruments with the experts. The items were revised based on their feedback. Following the revision, the survey was administered to a sample of 350 individuals who were prior users of the curation commerce website. As we wanted to gather data on consumer perceptions about the important characteristics of curation commerce websites, we eliminated the answers from individuals who lacked experience with curation commerce websites. Of the 350 individuals contacted, only 205 answers qualified for analysis.

Table 1 – Survey Instrument Items

Variables	Item	Content	Reference
Provider Recommendation Argument Strength	PAS1	Provider Recommendation Arguments are convincing.	(Cheung, et al., 2009)
	PAS2	Provider Recommendation Arguments are persuasive.	
	PAS3	Provider Recommendation Arguments are strong.	
Consumer Review Argument Strength	CAS1	Consumer Review Arguments are convincing.	
	CAS2	Consumer Review Arguments are persuasive.	
	CAS3	Consumer Review Arguments are strong.	
Provider Recommendation Sidedness	PSD1	Provider Recommendation includes both pros and cons of product/service.	
	PSD2	Provider Recommendation includes only one-sided comments (positive or negative).	
	PSD3	Provider Recommendation explains both strong points and weak points of the product/service as a neutral position.	
Consumer Review Sidedness	CSD1	Consumer Review includes both pros and cons of the product/service.	
	CSD2	Consumer Review includes only one-sided comments (positive or negative).	
	CSD3	Consumer Review explains both strong points and weak points of the product/service as a neutral position.	
Provider Recommendation Length	PL1	Provider Recommendation length is enough for goods.	(Baek, Ahn and Choi., 2012)
	PL2	Provider Recommendation length is appropriate for introducing goods.	
	PL3	Provider Recommendation length provides no overflow/no deficient information about goods.	
Consumer Review Length	CL1	Consumer Review length is enough for the goods.	
	CL2	Consumer Review length is appropriate for introducing goods.	
	CL3	Consumer Review length provides no overflow/no deficient information about the goods.	
Provider Recommendation Product Presentation	PPP1	Provider Recommendation provides sufficient size of visual cues.	(Lee and Benbasat, 2003)
	PPP2	Provider Recommendation provides high resolution of visual cues.	
	PPP3	Provider Recommendation provides various figures taken from different angles of goods.	
Consumer Review Product Presentation	CPP1	Consumer Review provides sufficient size of visual cues.	
	CPP2	Consumer Review provides high resolution of visual cues.	
	CPP3	Consumer Review provides various figures taken from different angles of the goods.	

Variables	Item	Content	Reference
Perceived deception	PD1	The site exaggerates the benefits and characteristics of its offerings.	(Román, 2010)
	PD2	The site uses misleading tactics to convince consumers to buy its products.	
	PD3	The site is not entirely truthful about its offerings.	
	PD4	The site attempts to persuade you to buy things that you do not need.	
Consumer satisfaction	CS1	I am satisfied with my decision to purchase from this site.	
	CS2	My choice to purchase from this site was a wise one.	
	CS3	I am happy I made my purchase at this website.	
Consumer loyalty intention	CLI1	I plan to do business with this website in the future.	
	CLI2	I would recommend the website to someone who seeks my advice.	
	CLI3	I will advise friends and relatives to try this website at least once.	

4.2 Sample

In August 2015, we conducted a web-based survey and a paper-based survey. Sample of this research is collected on 3 major curation commerce websites in South Korea. 3curation commerce websites have similar infrastructure and all of them has enough quantity of PR and CR. The characteristics of the respondents are represented as follows. We had a diverse sample of respondents with approximately 50% between the ages of 20 and 29 and approximately 30% between the ages of 30 and 39. More than 97% had a purchase experience in the past six months. Moreover, 94% of respondents spent more than 10,000 won on the curation commerce website during one transaction. Additionally, more than 70% primarily used the curation commerce website for experiential products. The profiles indicate that they were heterogeneous and had considerable curation commerce experience. We estimated the level of non-response bias by comparing early and late respondents. According to the method proposed by a prior study (Armstrong and Overton, 1977), the t-tests for each case showed that the early and late respondents had no significant differences in terms of their gender, age, and occupation.

5 DATA ANLLYSIS AND RESULTS

Data analysis was conducted using the structural equation modeling technique of partial least squares (PLS) with SmartPLS 2.0. PLS is primarily intended for causal-predictive analysis in situations of high complexity. Additionally, regarding the sample, PLS is not as restrictive as multivariate normal data distributions, and scales may be ordinal. We first conducted the validity of the measurement instrument and then tested the hypotheses.

5.1 Measurement Model

To verify the instrument conceptually, seven innovation management researchers, two curation commerce website managers, and two curation commerce curators examined the measurement items and reviewed their face validity. We further inspected the constructs for convergent and discriminant validity. Convergent validity can be assessed using the following criteria: (1) the factor loadings of survey items should be significant and exceed 0.7, (2) the composite reliability (CR) and Cronbach's alpha should exceed 0.7, and (3) the average variance extracted (AVE) of the constructs should exceed 0.5 (Fornell and Larcker, 1981; Gefen, Straub and Boudreau, 2000). As shown in Tab. 3, the standardized path loadings of all survey items are significant (t values > 1.96) and larger than 0.7. The CR and Cronbach's alpha for all constructs exceeded 0.7 and the AVE for each construct was larger than 0.5. Therefore, the measures show good convergent validity.

Table 3 – Convergent Validity

Variables	Factor Loadings	AVE	CR	Cronbach's α
PAS	0.725, 0.887, 0.879	0.695	0.871	0.780
PSD	0.975, 0.763, 0.973	0.826	0.934	0.901
CLI	0.928, 0.874, 0.895	0.808	0.927	0.881
PPP	0.873, 0.884, 0.885	0.776	0.912	0.865
PL	0.801, 0.972, 0.940	0.823	0.923	0.897
CAS	0.819, 0.803, 0.869	0.690	0.869	0.814
CSD	0.897, 0.918, 0.859	0.795	0.920	0.874
CPP	0.827, 0.826, 0.971	0.769	0.909	0.944
CL	0.757, 0.955, 0.960	0.802	0.923	0.880
PD	0.874, 0.851, 0.749	0.683	0.866	0.769
CS	0.932, 0.958, 0.949	0.895	0.962	0.941

Note: PAS: Provider Recommendation Argument Strength, PSD: Provider Recommendation Sidedness, CLI: Consumer Loyalty Intention, PPP: Provider Recommendation Product Presentation, PL: Provider Recommendation Length, CAS: Consumer Review Argument Strength, CSD: Consumer Review Sidedness, CPP: Consumer Review Product Presentation, CL: Consumer Review Length, PD: Perceived Deception, CS: Consumer Satisfaction.

Discriminant validity is estimated using the guidance suggested by Fornell and Larcker (Fornell and Larcker, 1981), in which the square root of AVE for each construct should exceed the correlation between it and any other constructs. Tab. 4 represents the correlation matrix, with the correlations among the constructs and the square root of AVE shown diagonally. The diagonal values exceed the interconstruct correlations; hence, the result of the test of discriminant validity is acceptable.

Table 4 – Discriminant Validity

	PAS	PSD	CLI	PPP	PL	CAS	CSD	CPP	CL	PD	CS
PAS	0.83										
PSD	0.15	0.90									
CLI	0.36	0.16	0.89								
PPP	0.41	0.16	0.50	0.88							
PL	0.29	0.06	0.35	0.45	0.91						
CAS	-0.13	-0.11	0.07	-0.02	-0.05	0.83					
CSD	0.11	-0.08	0.25	0.33	0.11	0.01	0.89				
CPP	0.04	0.18	0.23	0.15	0.05	0.30	0.17	0.88			
CL	0.02	0.09	0.08	0.01	0.07	0.43	0.09	0.41	0.89		
PD	-0.17	0.04	-0.32	-0.28	-0.20	0.20	-0.21	-0.04	0.19	0.83	
CS	0.39	0.14	0.49	0.51	0.36	0.05	0.32	0.22	0.05	-0.37	0.96

Note: PAS: Provider Recommendation Argument Strength, PSD: Provider Recommendation Sidedness, CLI: Consumer Loyalty Intention, PPP: Provider Recommendation Product Presentation, PL: Provider Recommendation Length, CAS: Consumer Review Argument Strength, CSD: Consumer Review Sidedness, CPP: Consumer Review Product Presentation, CL: Consumer Review Length, PD: Perceived Deception, CS: Consumer Satisfaction.

After testing the measurement model, we checked for possible common method variance (CMV). Harman's single-factor test examined whether a single factor accounted for a majority of the variance in the data (Podsakoff, et al., 2003). Principal component analysis with eigenvalues larger than one was used to extract the factors. The CMV analysis result showed that CMV was not a serious problem in this study.

5.2 Structural Model

We tested the hypotheses using PLS. Fig. 3 represents the results of the PLS structural model assessment including the overall explanatory power and estimated path coefficients. Tests of the significance of all paths were performed using the bootstrap resampling procedure.

CR argument (β = - 0.214), CR sidedness (β = - 0.115) and PR product presentation (β = - 0.231) have significant influence on perceived deception at $p < 0.01$, $p < 0.01$ and $p < 0.01$. Thus, H1b, H2b and H3a are supported. Perceived deception (β = - 0.369) has a significant effect on consumer satisfaction, and consumer satisfaction (β = 0.787) has a significant effect on consumer loyalty intentions at $p < 0.01$ and $p < 0.01$. Thus, H5 and H7 are supported. However, the path coefficients of PR argument strength, PR sidedness and CR product presentation showed insignificance to perceived deception and the path coefficient of perceived deception to consumer loyalty intentions (H1a, H2a,

H3a, H4b, and H6). The explanatory power (R^2) for perceived deception (0.15), consumer satisfaction (0.14), and consumer loyalty intentions (0.64) are larger than the accepted threshold of 0.10 (Falk and Miller, 1992).

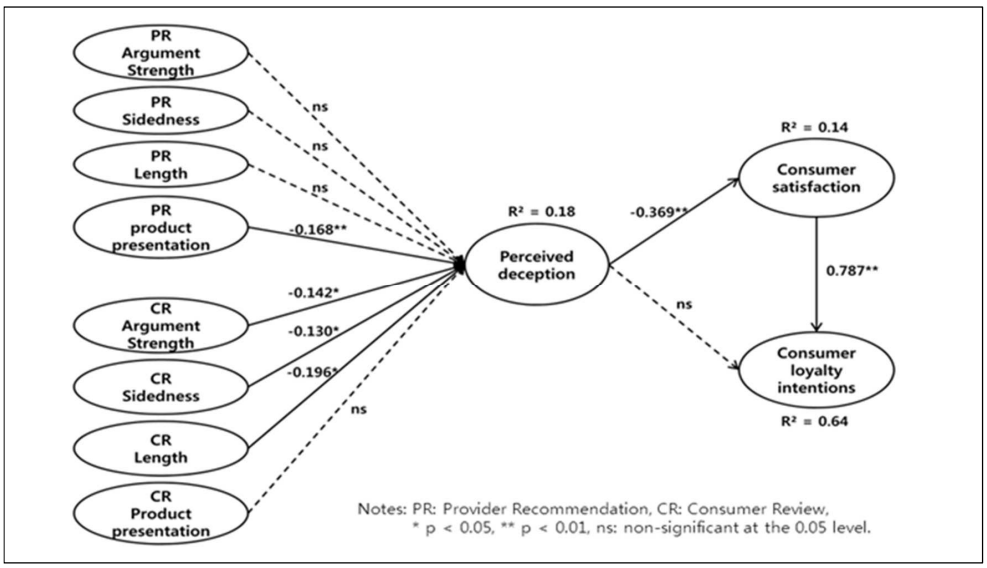

Figure 3 – Results of the Hypotheses Tests

6 CONCLUSION

6.1 Discussion of the Findings

Our results contain several important findings. The first finding is that perceived deception acts as a key indicator of consumer satisfaction and consumer loyalty intentions. Statistically supported independent variables influence consumer satisfaction and consumer loyalty intentions through perceived deception. Additionally, in contrast to our expectations, perceived deception had no direct influence on consumer loyalty intentions when estimating the relationship between satisfaction and loyalty. Interestingly, a post-hoc analysis revealed that perceived deception had an important and significant effect on consumer loyalty intentions when the path from satisfaction to loyalty was not estimated. Perceived deception has significant influence on consumer satisfaction(β = - 0.371) and consumer loyalty intentions(β = - 0.329) at $p < 0.01$ and $p < 0.01$. The explanatory power (R^2) for perceived deception (0.15), Consumer satisfaction (0.14) and consumer loyalty intentions (0.11) are larger than the accepted threshold of 0.10 (Falk and Miller, 1992). In conclusion, this finding highlights the concept that the key mediating role of consumer satisfaction in perceived deception is the consumer loyalty intentions link. Additionally, the theory of reasoned action (TRA) explains that attitude (consumer satisfaction) is essential to raising consumer behavioral intentions (consumer loyalty intentions). These

results are also consistent with the prior work of Ingram et al. and Román (Ingram, Skinner and Taylor, 2005; Román, 2010).

Next, among the PR characteristics, only PR product presentation plays a significant role regarding consumer loyalty intentions. This effect can be explained by the notion that consumers tend to believe that PR product presentations cannot be manufactured easily. However, the strength of the PR argument has no effect on consumer loyalty intentions. One interviewee, who is a practical curation commerce website manager, explained the concept as follows. In the online shopping environment, the possibility of exaggeration through PR argument strength by the provider/curator always exists. Therefore, consumers can doubt the trustworthiness and tend not to take into account argument strength.

In addition, our findings indicate that CR argument strength influences consumer loyalty intentions through perceived deception and consumer satisfaction. This finding is similar to that of previous research that found that CR argument strength directly influences the perceived credibility in a consumer forum website (Cheung, et al., 2009). This finding may be interpreted to indicate that readers do not blindly follow CR. Consumers believe in reviews that are supported by valid and strong arguments. Additionally, consumers in curation commerce websites do not feel the deception when they refer to two-sided reviews. One curation commerce website manager agreed with this finding. He mentioned that consumers are likely to think that having CR that are too positive are manufactured by the provider and CR that are too negative are fabricated by other competitor firms. Therefore, maintaining the balance of sidedness to affect other consumers is important. This finding contradicts prior similar research (Cheung, et al., 2009).

6.2 Practical Implications

This study presents a picture that describes the effects of PR and CR characteristics on curation website loyalty intentions. We derive a number of practical implications and provide them to practitioners and administrators of curation commerce websites with strong instructional insights.

First, to enhance the competitiveness of a website, a loyalty provider should offer adequate product presentations of good quality and enough quantity of presentation to its consumers. The provider should upload not only images taken from various angles but also more detailed presentations. For example, in the case of clothing, the provider needs to offer photographs of the clothing taken from various angles and of men with different body shapes wearing the clothing in different lighting. Such photographs can be helpful to consumers who have not seen the actual clothing and help in decreasing the deception of the curation commerce website.

Second, the website manager cannot directly manage CR. However, they are able to manage reviews in various indirect ways. A manager should fix spelling errors

and typographical errors, and delete the content in other product advertisements. According to our research findings, consumers on a curation commerce website do not blindly follow other consumers' reviews but are concerned about CRs' overall quality. Therefore, a website manager who pays attention to managing CRs can be useful in strengthening the consumer loyalty intentions of the website.

Third, our research findings highlight the concept that CR sidedness also needs to be managed. In general, we expect that only CRs with a positive aspect would have a positive effect on purchase intention and website consumer loyalty intention. However, according to our findings, we discovered that consumers' reference to a review that contains both positive and negative contents about a product is more effective for a website's consumer loyalty intention. For this reason, a website manager should lead consumers to write reviews with both positive and negative content and do not be afraid of negative opinion about their product. For example, the manager could notify consumers that writing both positive and negative opinions is good for the product. Such a method can result in two-sided reviews and indicate to consumers the website's willingness to consider weaknesses in its products.

6.3 Theoretical Implications

This study makes several important scientific contributions.

First, in the marketing context, previous traditional research found strong evidence for a positive effect of consumer satisfaction on consumer behavioral intentions. This study is one of the few to clarify the strong and positive effect from consumer satisfaction on consumer loyalty intentions in the online business context (Fassnacht and Køse, 2007; Román, 2010). Additionally, our findings extend the prior theory of reasoned action (Fishbein and Ajzen, 1975), which theorized that consumer behavioral intentions (e.g., consumer loyalty intentions) are determined by attitude (e.g., consumer satisfaction). In particular, we verified this relationship to curation commerce, which is the newest type of e-commerce.

Second, From this study, we clarified the negative perception of the consumer (deception) as a mediating factor. This attempt extends the analysis related to consumer psychology, consumer perception, and consumer behavior. Additionally, several prior studies discovered an influential provision of PR and CR on the usefulness and social presence of an online shopping website. To obtain some more tangible findings, we verified the effects of PR and CR stimuli. These findings reflect consumers real purchase behavior in a curation commerce website.

Third, because curation commerce is a relatively new concept, academic research on curation commerce is insufficient. Thus, the conception of curation commerce is unclear. Our research attempts to apply a mixed method to define and obtain insights into curation commerce and to enrich the existing findings. This attempt could form the basis for research on curation commerce.

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Assessment of Innovation Potential of Gayo Coffee Agroindustry

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ABSTRACT

Purpose: The purpose of this study is to perform an assessment on the innovation potential of Gayo coffee agroindustry, as a basis of policymaking as an effort to promote agroindustry and to increase the revenue.

Methodology/Approach: Innovation potential assessment was performed with "Map of the Company Innovation Potential" through a stakeholder survey by using questionnaire and confirmation.

Findings: The result of the study shows that innovation potential of Gayo coffee agroindustry is good enough to be developed by considering today's reality and condition, based on innovation potential assessment that had been performed. This condition is very possible for the development of innovation activity in the form of work and the agroindustry program of Gayo coffee becomes more serious concern, so that the potential of innovation improvement can continue to grow and evolve by involving various parties to create a synergy in supporting innovation development.

Research Limitation/implication: This study describes the condition of innovation potential of Gayo coffee agroindustry in six aspects of assessment, which are: strategy and planning, marketing, technological process, quality and environment, logistic and human resources.

Originality/Value of paper: This article is according to field data from an interview with the stakeholders, field trip, and quantitative analysis. This study is very helpful for the policy maker in expanding Gayo coffee agroindustry, and become a contribution to analyze innovation potential in other agroindustry.

Category: Research paper

Keywords: agroindustry; Gayo coffee; assessment; innovation potential

1 INTRODUCTION

The concept of regional expansion that is most relevant in 21st century is through a concept of expansion based on technology and innovation, whose one of the indicators is the human resources capacity. Technology and innovation are main strength in order for the efficiency in agricultural to occurs that is seen from the comparison of the input and output (Mosher, 1966; Alkadri, 1999). A form of intervening changes in society and industry is process of innovation transfer. This process can go through the diffusion of innovation that is communicated to various channels in a certain period and in a certain system. By this diffusion of innovation, it is expected for the innovation adoption to occur so the capacity and competency of human resources will increase along with the ability to adopt the introduced innovation (Rogers, 2003). Process of policy making of innovation is a process where an individual receives a foreknowledge of an innovation to form an attitude towards the innovation, to make a decision; whether to adopt or to refuse, the performance of new idea, and to confirm the decision that will be implemented.

A systematic innovation management is a main supporter to increase the competitiveness of small and medium-scale industry. The successful realization of vision and innovation strategy in business practice is subject to conditions existence which is determining related innovation activity (Sabadka, 2012; Špaček and Štěpán, 2013). MERIT Centre (Maastricht Economic and Social Research and Training Centre on Innovation and Technology) published a study about innovation in the member state of the European Union (MERIT, 2008). Nevertheless, most of studies and literatures are focused on the companies as the generator of innovation. Every company has potential to become creative and innovative. According to Goffin and Mitchell (2005), the key of innovation is the changes in client (customer) needs, the changes in business environment, the increased in competition, and new technology.

Practically, today's study of innovation is focused on the assessment of innovation or audit of innovation and innovation management. In the process of designing company's strategy, it is important for the top management to get used to prioritize the competitive excellence of the company in the field of innovations. Thus, innovation is not only about producing creative business ideas, but it is about paying more attention on the idea by identifying people that is possible to become a success innovator. Unfortunately, many companies and organizations make mistakes in refusing an idea that is potentially innovative and even supporting other ideas that are less innovative (Baumgartner, 2010).

Assessment of innovation potential is important for the continuity of an industry, that various studies had been developed in various methods to find a way of how to measure the potential level of an innovation. Several studies about innovation potential, among others are, matrix of innovation potential (Sabadka, 2012), evaluating innovation potential through the measurement of innovation behavior in company (Jiřinová and Scholleová, 2015), measuring value of innovation

potential in an organization in India (Khanapuri, Soni and Sharma, 2011), assessing innovation potential in the development of regional business environment in Russia (Parshukov, et al., 2015; Zemstov, 2014), strengthening value innovation potential with industrial orientation in Taiwan (Chang, 2013), agricultural innovation and new business by assessing commercial potential (Gray, et al., 2004), evaluating innovation idea (Baumgartner, 2010), concept of service innovation in United States (Ezell, Ogilvie and Rae, 2007), identification of innovation and innovator with high potential in the field of information, communication, and technology, competition program and innovation framework, also horizon 2020 of European Union (De Prato, Nepelski and Piroli, 2015), and assessing innovation potential of company in Romania (Scarlat, Alexe and Scarlet, 2011).

Agroindustry of Gayo coffee in Aceh province-Indonesia is one of businesses that is important in improving the community economy in that region, particularly in coffee Gayo-producing region, which are Central Aceh Regency, Bener Meriah Regency, and Gayo Lues Regency. Gayo is a name of a highland that is located in Bukit Barisan Mountain whose region is administratively located in Aceh province, and involving the three regencies mentioned above. However, regions that are dominant in producing Gayo coffee are only two regencies; Central Aceh Regency and Bener Meriah Regency. Coffee plants in this area has been existed since 1908, and now it reaches 81,000 hectares of coffee plantation (Putri, Fariyani and Kusnadi, 2013).

Gayo coffee is usually exported to the member state of European Union, United States, and Japan in the form of coffee beans or green bean (ICCRI, 2008; Silitonga, 2008). In the International Coffee Organization Report (2011) it mentioned that the trend of Gayo coffee trading to the importing countries is increasing. This condition is in accordance with the increased trend of Arabica coffee demand in world market that reaches 0.5% per year.

One important aspect in promoting agroindustry is by developing technology and innovation, because technology is a system that is closely linked to the engineering context from several fields of science appropriately to increase the value-added of the product resulted, while innovation is defined as an idea, method, practice, or product (goods and services) that is perceived as novelty by a unit for adoption (Rogers, 2003). The presence of technology and innovation certainly need an excellent implementation by the user community (Maulana, 2013).

The purpose of the study is to perform innovation potential assessment of Gayo coffee agroindustry as a model for the development of coffee industry in Indonesia for the increasing in revenue and better competitiveness.

2 METHODOLOGY

One method that is more complete in assessing innovation potential is the one that was developed by Vacek, et al. (2001). They developed an indicator for innovation potential that is called as "Map of the Company Innovation Potential" and had been applied in assessing innovation in a manufacturing industry. Based on the method, authors made an adjustment to be applied in assessing innovation potential in agroindustry (agricultural industry). To evaluate innovation potential, a questionnaire guide was comprehensively designed, covering 6 aspects as assessment criteria (Fig. 1). In each aspect, there are 6 questions with 4 answer choices with ordinal scale; strongly agree, agree, disagree, or strongly disagree.

Figure 1 – Innovation Potential Assessment Framework

2.1 Procedure of Research

The prepared questionnaire covers several groups that are interrelated to assess company's innovation potential (Tab. 1). Questionnaires is to describe the situation of the Gayo coffee company (agroindustry) in general in Aceh province-Indonesia by assessing the level of high and low state of the company to create an environment for developing the innovation effectively. This includes how a company able to implement innovation in its various activity. The purpose of this innovation activity is a part of effort to increase customer's and other stakeholder's satisfaction. The final result will be classified in four classes (Tab. 2).

Table 1 – Assessment Aspects and Questions Object (Adopted from Vacek, et al., 2001)

Assessment Aspects	Questions Object
Strategy and planning	1. Idea about the future of agroindustry
	2. Vision and worker
	3. Agroindustry innovation program
	4. Modification of planning
	5. Planning of financial indicator
	6. Project management
Marketing	1. Monitoring current market trends
	2. Evaluating market competition position
	3. Customer's orientation
	4. Monitoring customer's respond towards the product
	5. Market information flow
	6. Marketing and financial control
Technological process	1. Future agroindustry competition
	2. Changes in technology use
	3. Collecting stimulation to perform technology change
	4. Evaluating the return of investment in accordance with the planned changes.
	5. Calculating production cost and continuous monitoring in the company
	6. Creating resources for development
Quality and Environment	1. Monitoring the changes in quality management condition in company
	2. Evaluating individual contribution to the quality system in company
	3. Quality of external audit in company
	4. Monitoring the activity as the company's effect to the environment.
	5. Effect of the quality monitoring on the change process in the company.
	6. Resources creation to the cost resulted from the modification of standards, regulations, and law in the field of quality and environment.
Logistics	1. Organizing the purchasing and the distribution channel in company

Assessment Aspects	Questions Object
	2. Optimizing company logistics
	3. Transfer of information and communication with partner companies
	4. Flexibility of logistics process
	5. Introducing innovation in logistics
	6. Logistics and financial control
Human Resources	1. Workers satisfaction
	2. Workers motivation
	3. Management and communication
	4. Conflict resolution
	5. Company information system
	6. Company culture

Table 2 – Classification of Company Innovation Potential (Adopted from Vacek, et al., 2001)

Classification	Score	Definition
A	3.50 – 4.00	The agroindustry company has met all conditions and innovation potentials to keep growing well.
AB	2.50 – 3.49	The agroindustry company has met some conditions to work effectively with innovation potentials that are still possible to be improved.
B	1.50 – 2.49	The agroindustry company has work environment which has not met the expectation in developing its innovation activity.
C	0.50 – 1.49	The agroindustry company is not conducive or not appropriate yet for the implementation of innovation activity; a radical and systematic change is necessary either in the activity or in the organization.

2.2 Stakeholder Survey

This study uses stakeholder survey to make an assessment towards innovation potential of Gayo coffee agroindustry so that it can be used as reference for the policymakers in directing various activity which are as efforts in building and developing innovation. The stakeholders that are considered competent to give rating are the parties that are directly associated with Gayo coffee agroindustry. In this innovation potential assessment process, a poll was performed of five stakeholders consisting of a lecturer from Gajah Putih University (UGP) Takengon-Aceh, coffee farmer, local coffee entrepreneur, Forestry and Estate Crops Service of Central Aceh Regency, and coffee community. The combined

opinion was analyzed until a mode of opinion selection is achieved as an innovation potential value to the existence of today's Gayo coffee agroindustry.

3 RESULT AND DISCUSSION

The result of innovation potential assessment towards agroindustry of Gayo coffee shows that it occupies AB (Good) classification class with score by 2.72. it means that agroindustry in this category has fulfilled the preconditions to work more effectively with innovation potential it has. This means that it is in accordance with basic standard which is capable to use changes and innovation to ensure its continuity in the future and even a part of it has gone through certification process to get into more advanced and more developed stages. This condition is very helpful for Gayo coffee agroindustry in developing their innovation potential through organization or human resources development program with various facilities for training and developing the existing individuals' potentials.

In general, it seems that Gayo coffee agroindustry has excellence in logistics, and weakness in the aspect of strategy and planning (Fig. 2). The aspect of strategy and planning occupies category B (Fair, 2.17) which means that agroindustry in current condition has strategy and planning system that is still weak, so that the innovation potential is also still too little to meet the desired expectation. A number of activities are necessary in arranging various future plans, includes various strategy that may be necessary to be prepared for facing sundry possible changes that may occur.

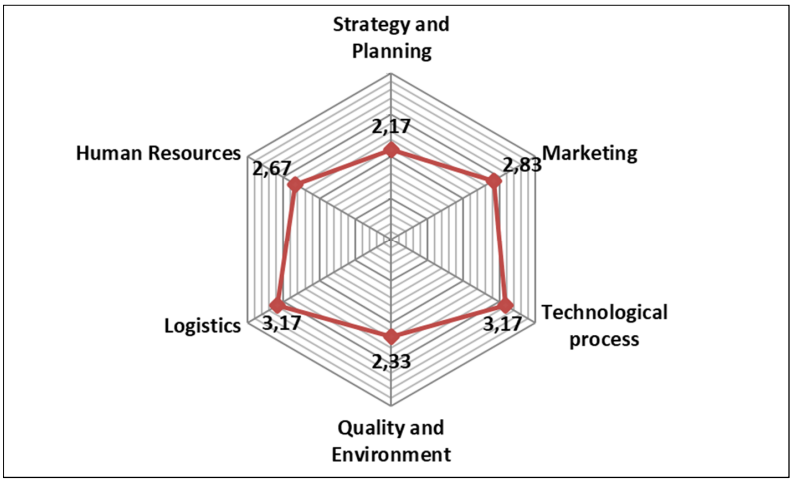

Figure 2 – Chart of Innovation Potential Assessment

Aspect of logistics (3.17), technology (3.17) and marketing (2.83) is quite encouraging because they are in AB class (Good). This is in accordance with the prevailing conditions that all this time, several certifications have been made in

coffee agroindustry system (since 1992), such as fair-trade, rain-forest, organic, and geographical indications (Taylor, 2005; Raynolds, 2009; Putri, Fariyani and Kusnadi, 2013; ICCRI, 2008; Waroko, et al., 2008; Yantu, et al., 2010; Ardiyani and Erdiansyah, 2012; Fadhil, et al., 2017), that it causes logistical process associated with distribution and marketing become better than other aspects.

In marketing aspect, coffee trading still suffers problem like very high price fluctuations, and tend to be unfair among several agroindustry businessmen (Adam and Ghaly, 2007; Giovannucci and Potts, 2008). Market mechanism is not maximized yet, so the price is determined by other parties (trader) that is relatively cheaper and sometimes the value of the product is not worth the production cost (Bilhak and Maarif, 2014; Mujiburrahman, 2011). As well as the quality and environment aspect, where several problems come up, such as lack of maintenance – especially in pruning and replanting, there are still old plants by about 10% from total coffee-producing plants –, fertilizing system that does not follow the principles, such as not timely fertilization, excessive or deficient dose, improper composition and fertilizing technique. Those are some problems that need to get treatment (Hasni, 2011; Descroix and Snoeck, 2009).

Meanwhile, aspect of human resources is also low, although it is classified in category AB (Good, 2.67). However, in this condition, it is realized that the development of comprehension and management of knowledge in coffee cultivation are still less, includes the application of the latest technology and innovation, because they rely more on hereditary knowledge of family (Indra, 2011; Romano, 2009). The other problems associated with human resources are: the development and enhancement of human resources are highly dependent on counseling with lack of facility and limited number of officers; if compared to the area of plantation that has to be addressed (Jaya, 2013; Silitonga, 2008), the lack of human creativity and innovation in processing the products and lack of process industry; particularly the one associated with post-harvest treatment and preliminary treatment, such as fermentation, semi-wet processing, and water usage efficiency (Fatma, 2011; Bilhak and Maarif, 2014). Continuous education and training are necessary for coffee farmers so that the production quality could be better in the future (Walker, 2015; Novita, 2012; Muiburrahman, 2011).

This study has given significant contribution towards the development of Gayo coffee agroindustry, particularly the one related with innovation potential that will be developed. Nevertheless, the study about innovation assessment and innovation audit will continue to evolve in accordance with various advances that lead to finding the best solution in facing global competition. An industry (including agro-industry) is always demanded to evaluate how far the corporation capability is to survive and evolve. Hence, application for innovation potential assessment in Gayo coffee agroindustry become one of research contributions in mapping ways for developing agroindustry innovation to become more favourable.

4 CONCLUSION

Innovation potential of Gayo coffee agroindustry is good enough to continue to be developed by considering the current reality. Many efforts of creating possible condition that will allow innovation activity to grow in the form of work and program in Gayo coffee agroindustry must become serious concerns, so the potential of innovation improvement and development can continue to grow and evolve from time to time. The involvement of various parties, especially local governor, college, related agencies, and extension agency, to synergize in supporting the development of innovation, is necessary. Concerns that are most in need of early treatment are aspect of strategy and planning, human resources aspect, and also quality and environment aspect. These three aspects got low score in innovation potential assessment of Gayo coffee agroindustry, compared to other aspects that have shown better progress. Theoretically, innovation potential assessment is noteworthy for the continuity of an industry, because the condition of the industry innovation potential is a space for development that impacts in competitiveness, and moreover, it promises industry sustainability in facing global challenge.

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The Application of Data Envelopment Analysis in Healthcare Performance Evaluation of Rehabilitation Departments in Hungary

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ABSTRACT

Purpose: Performance evaluation is a general problem both in production and service systems. Generally, operation performance is determined based on input resource utilization and on outputs related data. Performance evaluation is especially complicated when both financial and nonfinancial indicators must be considered in the evaluation of the efficiency of healthcare system. The purpose of this paper is to apply data envelopment analysis (DEA) in order to measure the efficiency of rehabilitation departments curing musculoskeletal diseases.

Methodology/Approach: The evaluation of the efficiency of rehabilitation departments includes several parameters. Performance evaluation becomes complicated when several evaluation criteria must be taken into consideration at the same time. In these cases, scoring methods are generally used, which transform performance data into a common scale and an aggregate score is calculated with subjective weights. Using DEA the subjective element of evaluation is eliminated when the weights of inputs and outputs are determined.

Findings: The applied DEA model evaluates the performance of rehabilitation departments. The presented analysis highlights the differences between the efficiency of the studied departments, and explores inefficiencies related to economies of scale. The slack values directly show the operational shortcomings in specific areas, and indicate the exact amount of the required changes.

Research Limitation/implication: The applied DEA model evaluates the performance of rehabilitation departments. The presented analysis highlights the differences between the efficiency of the studied departments, and explores inefficiencies related to economies of scale. The slack values directly show the operational shortcomings in specific areas, and indicate the exact amount of the required changes.

Originality/Value of paper: The originality of the paper lies on the identification of inputs and outputs for the applied DEA model as only nonfinancial indicators were taken into consideration. The analysis involves all rehabilitation departments of the Hungarian healthcare system; consequently, conclusions related to the general state of this area can be drawn.

Category: Research paper

Keywords: data envelopment analysis; healthcare; system efficiency; musculoskeletal diseases

1 INTRODUCTION

Quality has now become a key factor of competitiveness that cannot be disregarded by any service sector, including healthcare. The meaning and dimensions of quality are interpreted in different ways in the health sector. In its 1989 report, the WHO Working Group on Quality Assurance identified four components of quality: performance (as technical quality), efficiency of resource use, patient satisfaction, and risk management. Donabedian (1980) highlights efficiency as a separate dimension of quality. Despite the different interpretation, there is consensus that the concept of quality cannot be separated from that of efficiency.

In order to improve the operation of any system it is important to measure operational related characteristics and to evaluate system performance. Performance evaluation and efficiency measurement of health systems have several similar purposes. According to Vitrai and Vokó (2012), the purpose of efficiency analysis is to improve the health of the population, to share the financial burdens of health deterioration and to meet the expectations of the citizens.

Performance evaluation is particularly complicated, when several conflictive evaluation criteria must be considered at the same time. Evaluation is especially difficult, when these criteria are measured on different scales. Data envelopment analysis (DEA) is a special type of scoring method which can handle this problem. DEA has become commonly used in many service areas; it has been used, for example, to measure the efficiency of bank branches (Sherman, 1984), restaurants (Reynolds and Thompson, 2007), hotels (Hwang and Chang, 2003) and hospitals (Rosko, 1990). An interesting and new application area of DEA is the evaluation of the performance of participants in business simulation games (Koltai, et al, 2017).

The objective of the paper is to compare musculoskeletal rehabilitation departments in the field of in-patient care in Hungary using DEA. The paper presents the characteristics of Hungarian healthcare and suggests efficiency improvement possibilities based on DEA results.

In the following part of this paper first, some basic DEA models are introduced. Next, the most important characteristics and conditions for evaluating musculoskeletal rehabilitation departments are discussed. Finally, the DEA results are presented, some important conclusions are drawn, and further research possibilities are outlined.

2 BASIC CONCEPTS OF DATA ENVELOPMENT ANALYSIS (DEA)

Data envelopment analysis (DEA) is a quantitative method used to compare the performance of production and/or service systems. These systems are called as decision making units (DMU). The objective of DEA is to determine the efficiency of decision making units relative to each other. The best operation performance is determined based on the input and output data of the analyzed decision making units.

Various models are used depending on the application environment and on the objectives of management. If the objective is to minimize the amount of inputs without the change of output values, than an input-oriented model should be applied. If the objective is, however, to maximize the amount of outputs without the change of input values, than output-oriented models should be used.

Different models are applied when the size of the DMUs is an important factor in the analysis. We may consider constant return to scale (CRS) or variable return to scale (VRS) models. If we assume a *constant return to scale* (CRS) relationship between the input and output values then the size of the input does not influence the marginal change of output. When the effect of the change of input is not constant then a *variable return to scale* (VRS) relationship exists.

Several DEA models can be applied depending on the application environment. The selection of the model is influenced, for example, by the characteristics of the DMUs, by the nature of available data, and by the evaluation criteria. We applied an output-oriented variable return to scale slack-based model for the evaluation of rehabilitation departments. Notations applied in this paper are listed in Tab. 1.

Table 1 – List of Notation

Indices	
j	index of decision making units (DMUs) ($j = 1, \ldots, J$)
i	index of inputs ($i = 1, \ldots, I$)
k	index of outputs ($k = 1, \ldots, K$)
R	index of the reference DMU
Parameters	
J	number of DMUs
I	number of inputs
K	number of outputs
x_{ij}	quantity of input i of DMU j
y_{kj}	quantity of output k of DMU j
w_i^-	weight of input slack i
w_k^+	weight of output slack k
Variables	
u_i	weight of input i
v_k	weight of output k
λ_j	dual variable of DMU j
η	radial efficiency score
μ_R	slack based measure efficiency score of DMU R
s_i^-	vector containing the input surplus values of DMUs, belonging to input i
s_k^+	vector containing the output shortage values of DMU, belonging to output k

DEA is based on the idea that the measure of output is always less than the measure of input used to generate the output. Thus, the ratio of output measure and input measure must be less than or equal to 1 (Charnes, Cooper and Rhodes, 1978). The input-oriented CRS model describing these constraints and goals is the following:

$$\begin{aligned} &Max\left(\sum_{k=1}^{K} v_k y_{kR} / \sum_{i=1}^{I} u_i x_{iR}\right) \\ &\sum_{k=1}^{K} v_k y_{kj} / \sum_{i=1}^{I} u_i x_{ij} \le 1 \qquad j = 1,\ldots,J \\ &u_i, v_k \ge 0 \qquad\qquad i = 1,\ldots,I; \quad k = 1,\ldots,K. \end{aligned} \tag{1}$$

We applied the output-oriented variable return to scale version of the basic model (1). In case of output-oriented models, relative efficiency is measured by the ratio of the weighted inputs and weighted outputs. The value of this ratio is the

reciprocal of the relative efficiency score of the input-oriented model, consequently, the objective function must be minimised. According to the variable return to scale (VRS) model the value of the weighted input is modified by a variable u_{iR}. By definition, output-oriented relative efficiency is always greater than or equal to 1. The output oriented VRS model is as follows:

$$\begin{aligned} &Min\left(\sum_{i=1}^{I} u_i x_{iR} - u_{iR} / \sum_{k=1}^{K} v_k y_{kR}\right) \\ &\sum_{i=1}^{I} u_i x_{ij} - u_{iR} / \sum_{k=1}^{K} v_k y_{kj} \geq 1 \qquad j = 1,\ldots,J \\ &u_i, v_k \geq 0 \quad u_{iR} \leq 0, \; u_{iR} \geq 0 \quad i = 1,\ldots,I; \quad k = 1,\ldots,K. \end{aligned} \tag{2}$$

Linear programming (LP) problem (2) has an infinite number of solutions. Fixing the weighted output at value 1 and rearranging (2) by eliminating the ratio of variables, we get the primal version of the model. The dual version of problem (2), however, has more practical relevance. The output oriented VRS dual model is as follows:

$$\begin{aligned} &Max(\eta) \\ &\sum_{j=1}^{J} \lambda_j y_{kj} \geq \eta y_{kR} \qquad k = 1,\ldots,K \\ &\sum_{j=1}^{J} \lambda_j x_{ij} \leq x_{iR} \qquad i = 1,\ldots,I \\ &\sum \lambda_j = 1 \qquad \lambda_j \geq 0 \qquad j = 1,\ldots,J. \end{aligned} \tag{3}$$

The optimal value of the objective function of (3) is η*. Models (2) and (3) are based on a radial measure of efficiency, that is, all outputs are increased proportionally by the same ratio (η*). The slack based model (SBM) proposed by Tone (2001) uses independent input/output changes. The difference of the actual value and the best possible value is called slack. In (4), s_k^+ indicates the output increase possibility of output k, and s_i^- indicates the input decrease possibility of input i. Based on the slack values the following efficiency measure can be calculated:

$$\mu_R = \frac{1 - \sum_{i=1}^{I} w_i^- s_i^- / x_{iR}}{1 + \sum_{k=1}^{K} w_k^+ s_k^+ / y_{kR}}. \tag{4}$$

Objective function (4) is a non-oriented measure of efficiency. Depending on the orientation of the analysis either the nominator or the denominator can be ignored in the objective function. The *output oriented* approach applied in the following part of the paper uses the following objective function:

$$Min\left(\frac{1}{1 + \sum_{k=1}^{K} w_k^+ s_k^+ / y_{kR}}\right). \tag{5}$$

In the following, first, the importance of DEA in healthcare based on some relevant literature sources is summarized. Next, the application of DEA for the analysis of musculoskeletal rehabilitation departments in Hungary is presented.

3 APPLICATION OF DEA IN HEALTHCARE

The practical application of DEA is becoming more common in the field of healthcare. The operation of health systems shows differences by the effect of external and internal environmental factors. External environmental factors are, for example, demographic characteristics, financing, human resource trends, and regulations. Internal environmental factors are, for example, hospital capacity, facilities and amenities, technology, healthcare delivery and ownership structure. As a consequence of the different characteristics of health systems the objective of the analysis and the input and output variables applied can be different in each case. When analysing healthcare efficiency, several international studies focus on economic and social factors, and lifestyle such as unemployment rate or level of education (see, e.g., Spinks and Hollingsworth, 2009). Others use financial indicators because healthcare expenditure has important effect on public health, as well as on the operation of health systems (Hadad, Hadad and Simon-Tuval, 2011; Portafke, 2010; Rivera, 2010; Schoenberg, et al., 2007; Asandului, Roman and Puiu, 2014).

According to Akazili, et al. (2008), DEA is an essential method for evaluating the efficiency of health systems. The strategic and operational aspects of resource management can be evaluated by DEA (Akazili, et al., 2008). Kirigia and Boussofiane said that DEA enables to measure the efficiency of operational strategies in the health sector. As a result, the performance and the reference set of health systems can be determined and the efficiency of resource allocation can be evaluated (Kirigia, Emrouznejad and Sambo, 2002; Boussofiane, Dyson and Thanassoulis, 1991).

The selection and use of variables are especially difficult in Hungary as a consequence of incomplete data collection and data management in the health system. The use of DEA model in the Hungarian health sector has been limited to only a few studies (see, Csákvári, et al., 2014).

4 BACKGROUND OF THE RESEARCH

The objective of our research is to determine the operational efficiency of the musculoskeletal rehabilitation departments in Hungary. The aim of medical rehabilitation is to stabilize and restore the physical and mental conditions of patients, to reduce the harmful consequences of disability, and to facilitate the social reintegration of patients. In Hungary, rehabilitation is running in hospital departments, in specialist outpatient clinics and in specialist practice (inpatient), where each rehabilitation department offers a different service: musculoskeletal,

cardiac, psychiatric, pediatric, internal medicine and pulmonary rehabilitation. Departments show differences in organizational structure, financing, and the condition and treatment of patients, therefore, it is appropriate to analyze them separately.

The number of musculoskeletal disease patients is rapidly growing (Vos, Murray and Barber, 2015). The increasing number of musculoskeletal disease patients in the EU and in highly developed health-culture countries is a leading health problem. Musculoskeletal diseases have impact on the quality of life as well as on working and life expectancy. The treatment of these diseases imposes social- and financial- bourden on healthcare, on society, on patients and on their family (Dénes, 2015). Consequently, the rehabilitation of these diseases requires more attention.

The musculoskeletal rehabilitation process consists of different activities with shorter and longer periods of time. These methods and activities are such as diagnostics, physiotherapy, speech therapy, psychological care and training of the use of medical devices. Rehabilitation medicine makes differences between *post-acute* rehabilitation and *planned* rehabilitation. In the case of acute diseases or trauma, and when a chronic disease is getting worst (unexpected complications of an existing disability) post-acute rehabilitation is needed. Post-acute rehabilitation activities should start immediately after the need of healthcare has arisen, or within a maximum of one month. In the case of the planned rehabilitation the starting point of the treatment is not the most important factor.

In this paper we analyze the efficiency of inpatient departments of musculoskeletal rehabilitation in Hungary. The data used in this study are based on the 2014 national annual survey of the National Statistical Data Collection Program. International and national studies, data on population health and characteristics of the Hungarian health system are also considered in the analysis. Accordingly, different rehabilitation departments of the same institution have been aggregated when largely or entirely, they have shared common human resources. Hence, the number of organizational units has decreased from 116 to 87 departments. As a consequence of data collection problems 7 more departments have been ignored. Thus the final number of analyzed rehabilitation departments has been reduced to 80.

The efficiency evaluation of the 80 musculoskeletal rehabilitation departments and the results of the detailed analysis are presented in the following section.

5 THE MAIN RESULTS OF RESEARCH

The 80 rehabilitation departments are considered as the decision making units (DMU) in the analysis. Two outputs and four inputs were considered in the analysis. The two outputs are defined as follows:

- number of patients' day: total number of days, musculoskeletal patients stay in the department and undergoing rehabilitation procedures;
- number of patients discharged: total number of musculoskeletal patients who leave the department because of the rehabilitation treatment is finished or because of transfer to other department.

The four inputs represent the most important resources applied by the departments, which are the following:

- number of hospital beds: this indicator provides a measure of the resources available for delivering services to musculoskeletal patients at the department;
- number of physicians employed: the full time equivalent (FTE) of the number of doctors at the rehabilitation department (part time doctors with joint affiliation are considered with a 0.3 weight);
- number of nurses employed: the full time equivalent (FTE) of the number of nurses at the rehabilitation department;
- number of professional healthcare workers and other non-physician specialist (psychologists, speech therapists, physiotherapists, qualified masseurs, conductive teachers, physiotherapist assistants, occupational therapists, orthopaedic technician, social assistant, medical physical education, special education teachers, dieticians, other therapists, others).

As a consequence of the nature of the different forms of employment (part-time, full-time) we recommended the modification of the number of employees by using weights. These weights express the number of hours the employee is involved in the activity of the department.

We also note, that in order to avoid numerical problems when large linear programming model is solved, data must be scaled. In this case expressing the number of patient's days in thousand days, that is, dividing this data by 1,000 solves scaling problems.

Some statistical data describing the characteristics of input and output data are summarized in Tab. 2. Differences in size of rehabilitation departments can be assumed based on the large differences between minimum and maximum values, and on the value of standard deviations.

Our analysis consists of two parts. First, scale efficiency using output-oriented radial models based on problem (3) is analyzed. Next, the efficiency and improvement possibilities of each department using output-oriented variable return to scale slack-based models based on problem (5) are determined.

Table 2 – Statistical Data of Input and Output Data

		Minimum	Maximum	Mean	Stand.Dev.
Input	Number of hospital beds	15	210	73.6	50.94
	Number of physicians	0.9	20.8	4.58	3.64
	Number of nurses	0.3	63	20.116	12.87
	Number of non-physicians specialists	2	57.6	16.12	11.17
Output	Number of patients' day (thousand days)	0.8	76.6	24.095	18.04
	Number of patients discharged	105	3671	1,045.275	825.97

5.1 Analysis of the Size of Rehabilitation Departments

Output-oriented radial models are applied to explore the differences in size of the 80 rehabilitation departments. 15 departments (19%) show constant return to scale (CRS) characteristics. The size of these departments can be considered optimal. These departments are almost always located in spa towns and many of them are operated by specialized hospitals.

10% of the departments (8 departments) can be considered oversized, as a consequence of decreasing return to scale (DRS) characteristics. Many of these departments are aggregated and operated by hospital in large cities. The technical efficiency of four of these departments is 100%. Although they are oversized, their operation is efficient. In the case of the other 4 departments large size is paired with operational problems.

57 departments (71%) can be considered too small as a consequence of the increasing return to scale (IRS) characteristics. These departments are operated by small specialized hospitals in Budapest or in small towns in rural areas. Among the departments with IRS characteristics, 10 departments operate efficiently despite their small size, but the operation of the other 47 departments is inefficient.

The different size properties of the departments indicate the special characteristics of the Hungarian musculoskeletal rehabilitation system. Most of the departments with CRS are located in spa towns where planned and self-care patients are being cured (e.g., arthritis, osteoarthritis). In the case of planned rehabilitation, the number of beds and the utilization of human resources can be accurately planned.

Most of the units with DRS property are aggregated departments thus they operate high number of active beds and human resources.

The high number of the IRS departments indicates the regional and demographic characteristics of the Hungarian health system. Some of these small-sized

departments are located relatively close to each other and concentrated in Budapest, where there are a large number of patients. Other small departments operate in small towns.

5.2 Analysis of Improvement Possibilities

Output-oriented variable return to scale slack-based models were used to explore operational shortcomings, and improvement possibilities. Tab. 3 summarizes the input and output data and SBM efficiency score of some typical departments.

Table 3 – Input and Output Data, and SBM Efficiency Score of Some Typical Departments

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DMU	No. of beds	No. of doctors	No. of nurses	No. of other spec.	No. of patients' days (thousand days)	No. of patients discharged	SBM η	Reference set
H8	25	3	12	8.3	9.1	486	1	-
H11	40	4	25	13	11.5	450	0.472	8;79
H21	100	4.2	18	15.4	36.3	2,645	1	-
H27	131	6	27.6	16.8	43.2	2,159	0.779	20;21;77;85
H33	142	8	51	9	42	1,406	1	-
H35	179	12	47	28.8	65	3,223	1	-
H37	20	0.9	11	5.2	7.2	212	1	-
H39	95	1.5	28.3	31	31.7	1,438	1	-
H51	207	16	35	44.1	74.3	3,124	0.805	9;13;77
H54	145	9.3	24.6	47.5	36.6	2,250	0.512	13;21;77
H57	30	2	20	10.2	9.3	525	0.562	8;21;25;37
H63	20	1.3	8	7.6	5.3	139	0.653	8;9;19;37
H77	210	10.9	32	38.7	75.1	3,450	1	-
H83	178	9	44	57.6	64.1	2,837	0.683	13;20;21;35

The efficiency values of the 80 departments are between 0.47 and 1, but most of the scores are between 0.5 and 0.6, and between 0.9 and 1. The number of efficient ($\eta = 1$) departments is 25, although they do not have the highest output (lowest input) quantity. Each of these groups applied different strategy to operate their systems successfully.

Column 2 shows the number of hospital beds. We can see that the highest number of hospital beds is found at department H51, and the efficiency score of this department is not the highest.

Department H77 is similar to H51 in size, but it operates efficiently. Similar conclusion can be drawn in connection with department H57. This department has similar size characteristics as H8. H57 uses almost the same number of hospital beds as H8, even though the operation of H57 is inefficient. The reason for this is that department H57 should have generated higher outputs based on its inputs.

Columns 3-5 show the number of employees. The highest number of employee is found at department H83. Although H83 has similar number of employees as H35, the efficiency score of H83 is lower than that of H35. At department H83 the high number of employees was not pared with high values of the outputs.

Column 7 shows the number of patients discharged. Departments H35, H51 and H77 are among the departments with the highest value, with higher than 3,000 number of patients discharged. Despite of the fact that these departments achieved high output values by using high number of beds and employees, not all of them are efficient. Department H51 is inefficient with a 0.805 efficiency score.

The results show that we cannot draw conclusions on efficiency based exclusively on the amount of inputs or outputs. Only a combined analysis of all the inputs and outputs can provide information about the efficiency of operation and about the possible improvements of efficiency.

DEA provides information about efficiency values, and also about improvement possibilities. The last column of Tab. 3 shows the reference sets of inefficient departments. Following the strategy and operational policy of reference departments, inefficient departments can achieve efficient operation. As Tab. 3 shows, inefficient department H11 should adopt the good practices of H8 and H79.

The detailed analysis of the results revealed that most of the reference departments are located in spa towns, in small towns and/or those with mixed profile. For example, H8 is reference department of 35 inefficient departments. H8 is a small-sized department with mixed profile, and it is a reference department of several similarly small-sized departments.

Department H39 is an interesting example. This department is efficient, but does not appear in the reference set of any other departments. H39 is located in a new facility and carries out programmed rehabilitation activities. Similarly, department H33 uses unique strategy; it is one of the departments belonging to the 4 university hospitals in Hungary, and its operation, organizational structure, and management are different from that of the other hospitals.

The evaluation of the reference sets, however, must be made with care. It can be possible that an efficient department is in the reference set of an inefficient department which, however, has a different profile; consequently its operation practices cannot be implemented. Department H37, for example, has a mixed profile and, therefore, carries out various rehabilitation activities. This department is the reference set of department H63 which is a neuro-stroke

rehabilitation department carrying out a specific activity. A similar conclusion can be drawn in connection with the departments H8 and H11.

The efficiency score in Tab. 3 is an aggregate measure of operational efficiency. The independent change of each output and input are expressed by the slack variables. Slack values of some typical departments are summarized in Tab. 4.

Table 4 – The Efficiency of Some Typical SBM, Input and Output Slack Values

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DMU	SBM η	No. of beds (s_1^-)	No. of doctors (s_2^-)	No. of nurses (s_3^-)	No. of other spec. (s_4^-)	No. of patients' days (thousand days) (s_1^+)	No. of patients discharged (s_2^+)
H8	1	0	0	0	0	0	0
H11	0.472	0	0.71	10.54	1.74	0	104.01
H21	1	0	0	0	0	0	0
H32	0.568	0	0	27.86	8.2	0	335.81
H51	0.848	0	1.84	0	10.5	0	346.94
H54	0.514	0	1.57	0	23.58	3.62	0
H80	0.632	0	0	0.34	0	0	157.79

The results show that most of the inefficient departments have shortcomings with respect to the number of patients discharged. In the case of department H11, for example, the number of patients discharged should be increased by 104.1 in order to achieve efficient operation, independently from the number of completed days. According to the number of completed days, output shortage appears in only 5 cases. One of the 5 departments is H54 which can be seen in Tab. 4. For that matter, the days of treatment cannot be changed, since different types of diseases require different time for treatment, which is frequently determined by professional protocols. There are, however, subjective elements of the evaluation of the period of treatment. Consequently, there may be organizational measures which can help to reduce the number of treatment days.

Analysis of the slack values of the number of beds (s_i^-) show that one non-zero value can be found (none in Tab. 4). We can draw misleading conclusion from these values. A 0 slack values may indicate, that there are no improvement possibilities, that is, in the Hungarian rehabilitation departments the decrease of the number of beds does not increase efficiency. This, however, is not necessarily true. Since output-oriented models are used, the input slack values are not maximum values. In this case, the zero input slack does not necessarily mean that the input cannot be reduced. Nevertheless, a high input slack value indicates that an excess use of input has occurred. According to the slack values we can certainly conclude that in the case of inefficiency departments H11 and H32 the number of nurses can be significantly reduced. Similarly, in the case of

departments H51 and H54, the number of healthcare workers is considerably higher than necessary.

6 CONCLUSION

The application of DEA is not widespread in the healthcare system in Hungary; hence, the presented analysis can be an important example, which illustrates the potential benefits of its application. The presented study contains several simplifications. These are, however, due to the authors' efforts to present the possibilities of DEA using a relatively simple example, and not due the methodological deficiency of the applied method.

In the first phase of the analysis an output-oriented variable return to scale radial model has been used for analyzing the size of the departments. We concluded that the departments show significant differences in size, and the size of most of the departments is not optimal. Most of the units are smaller than the optimal size.

In the second phase of the study an output-oriented variable return to scale slack-based model has been used for exploring the improvement possibilities of the rehabilitation departments. We showed how operational shortcomings can be identified. The results indicate the problems of inefficient departments and the possible improvement of some seemingly well-operating departments as well. The evaluation of reference sets can provide additional useful information to improve operation. The reference set contains those departments whose operational practice should be followed to improve efficiency.

One of the main shortcomings of the presented analysis is that the mix of patients is not identical in all departments. Despite of the fact that all departments perform musculoskeletal rehabilitation, not all of them perform exactly the same activity. Most of the departments have a mixed profile, but the ratio of the rehabilitation reasons is not identical, furthermore, there are specialized institutions as well. Rehabilitation causes requiring a more complex treatment (for example brain injury) have a different input need than rehabilitation after simple surgeries. The objective of our further research is to eliminate this problem by categorizing the institutions according to their profile characteristics and using DEA models with categorical variables.

Another shortcoming of the presented study is that quality and patient satisfaction are not considered among the outputs. There is no theoretical obstacle to take into account such outputs. In order to incorporate quality oriented outputs, however, reliable quality/satisfaction related data must be determined for all the departments. The lack of such data is an important shortcoming of the Hungarian healthcare system.

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Governmental Theories – Students' Responses: Student Strategies Reacting to Changes in Hungarian Higher Education

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ABSTRACT

Purpose: By analysing enrolment data for the past few years, this paper searches for the answer to what extent government interventions influence the choices of students entering to higher education.

Methodology/Approach: The paper analyses statistical data of higher education applications and admissions for the 2010-2016 interval.

Findings: The analyses presented in this paper strengthen the fact that a significant number of students is ready to undertake financial burdens (i.e. pay tuition fee) in order to achieve their own goals or to disclose government restrictions and obligations, surprisingly even in STEM (science, technology, engineering, mathematics sciences) education. Despite the governmental interventions, economic faculties are still the most popular ones, while the politically favoured STEM faculties have not become more favourable due to the state subsidies.

Research Limitation/implication: Quality management activities of higher education institutions should strongly focus on and reflect to potential students and their needs, since it is primarily the students' choice to enrol to a specific institution's specific faculty, and if yes, to which.

Originality/Value of paper: According to the best of our knowledge this is the first analysis which has incorporated enrolment limit scores in the process of evaluation. Compared to the descriptive analyses available in Hungary, our research results have resulted in a more complex conclusion on the same basis.

Category: Research paper

Keywords: higher education; enrolment; student preferences

1 INTRODUCTION

A key question of quality management in higher education (HE) or in a particular higher education institution (HEI) is the identification of the 'customer'. Who is the one for whom a HEI provides a service, and whose expectations should primarily be met when it comes to quality issues? Is it the state or the students who 'buy' higher education services? Whose expectations would and should predominantly influence quality-related decisions and measures made by HEIs?

It is now evident that the direct customers of HE are the existing and potential students. However, the major role of state through various means of state funding cannot be neglected. The state also influences the existence and operation of HEIs, both directly and indirectly. In Hungary, an evident mean to intervene into HE is the distribution of state-financed student places for newly entering students among institutions and fields of studies. The state seems to enforce its preferences partly through these measures, namely, in terms of the number of state-funded degrees. Through this process the state validates its own criteria and intends to directly influence the number of students on particular fields of study at the institutions. Moreover, by doing so, the state directly influences the funding of an institution or a faculty. As a natural consequence, there should be a competition between institutions for state-funded students, as well as for attracting as many fee-paying students as they can. After all, students make a decision between faculties and institutions.

HE and the knowledge and skills acquired during these studies serve to achieve individual life goals. Another considerable characteristic of a 'high quality' HE system is its major contribution to the improvement of macro economy. By now, direct and indirect economic impacts of HE have almost become stereotypical both abroad and in Hungary. The positive socio-economic effects of HE are also supported by Hungarian official statistical data. Data from the Hungarian Central Statistical Office and the National Employment Service (KSH, 2017 and NFSZ, 2017) also confirm that HE graduates have higher salaries and a lower chance of unemployment than those with lower qualifications (e.g., Green, 1994; Dennison, 1989; Woodhall, 2007).

In 2011, the Hungarian government announced a significant intervention in the Hungarian HE policy. The Hungarian Parliament adopted the Act on National Higher Education in 2011, which entered into force in 2012. According to the Act, the condition of (partial) state grant is that the student shall be obliged, *'within twenty years after acquisition of the degree, to enter into and maintain employment or other work related status resulting in social insurance with an employer under Hungarian jurisdiction or undertake entrepreneurship under Hungarian jurisdiction (hereinafter: Hungarian employment) for a duration twice the length of the period during which he/she received (partial) state grant, an obligation which may be met in several stages*. Meanwhile, the government drastically reduced the state-funded capacity of law, economics and humanities programmes. Meanwhile, the student loan system for financing tuition fees has

also undergone a major development. The government also announced its primary focus on technology, IT and natural sciences programmes. Furthermore, at governmental level a priority was set up between university degrees and vocational training, by expressing that 'the honour of manual labour has to be restored'.

As of the aim of our paper, this legal-political change has offered a unique opportunity to examine the effects of governmental policies on students, how they react to such changes which clearly have effect on their future. The paper seeks the answer to how and to what extent state measures related to HE influence the decisions of potential students, and whether individual preferences change, and if yes, how, if the state changes the conditions and its preferences. Since no significant demographic change or other relevant large-scale event have taken place in the examined time period, it may be assumed that the sudden drastic changes relate to the political and legal interventions concerning HE in Hungary.

2 METHODOLOGY

Hungarian official HE database was examined for years 2010-2016 (available publicly at www.felvi.hu, the official website of the Hungarian Educational Authority). Amongst the data, the followings have been chosen for further investigation: first-place applications by fields of studies and by age groups; admission data by fields of studies and by financing forms; and the minimum (average) entering scores by fields of studies.

First-place applications show the primary aspiration of an applicant. According to the Hungarian HE application system, one can appoint several programmes of even different fields of studies expressing a preference ranking. That is the reason why all application data are not appropriate for our purpose, since the mere numbers of how many courses are listed altogether by all applicants do not say anything about either the number of the applicants (since one may choose several programmes) or their real preferences. The actual number of people behind the total applications can be best observed through first-place applications.

The **admission data by fields of studies, and by financing forms** have also been found expressive. These data can also indicate much about future students' attitude. Since applicants' preference lists include not only specific programmes at given fields of studies, but they also have to add the financing forms (state-funded or fee-paying or both with a ranking) they are applying for, the application data from this aspect is also a meaningful factor. Since the government's most impressive mean to directly influence the structure of HE is the allocation of state-financed places, the changes in the admitted students' financing forms are strong indicators of students' motivation. If state financing is not available for a student (either due to entering results, or to the lack of

sufficient available state-financing at a given programme), are they willing to pay tuition fee for their studies just to follow their own goals, or do they change their preferences and study what is available 'for free'?

Thirdly, the **minimum entering scores and the changes in their averages by fields of studies at different levels and financing forms** are examined. Through minimum entering scores the number and also the quality of students can be governed. The common assumption is that the higher the minimum entering score is, the fewer students can achieve that, but they are of better quality. By analysing the minimum entering scores, the following expectations may be formed. Where the number of applications decreases, in order to compensate this loss, HEIs would lower their entering score limits, especially at those studies and for those students where state-financing is not available or fee-paying of students is more dominant. Where the state explicitly supports a given field of study, in order to attract potential students and to fill in the state-financed places, HEIs would also reduce the entering scores.

But has this really happened? A number of changes, including considerably varying faculty structures and programmes have taken place in Hungarian HEIs during the examined period. Some programmes have newly been launched and some programmes have not been continued. Some fields of studies were statistically merged into others (like social services fusion with social sciences field of study) and some data inaccuracies can also be observed as well. For this reason, an all-encompassing and completely accurate data collection and analysis were not the main goal. It is also important to note that the used official www.felvi.hu statistics do not contain the data of postgraduate specialist training courses, and where separable, we have not considered HE courses that do not offer a degree.

3 RESEARCH RESULTS

3.1 An Overview of the Hungarian Higher Education in a Wider Perspective

The 16-year long data show two significant waves both with its own peaks and bottoms (Figure 1). The first major fluctuation took place between 2004-2009. This period clearly shows how the Hungarian society and potential students learnt to adopt the Bologna process. The process reached its deepest point in 2007, after which the numbers started to increase again. By 2010, the number of HE applicants and admissions was close to the numbers of 2004 and continued to slightly rise until arriving at a peak in 2011.

Hungarian HE experienced a second 'nosedive' within the examined period. Unlike the previously described period, the trough of this wave (examined to 2016) following the high point of 2011 shows a different curve. The number of those applying for higher education dropped down to the previous low point in

only a two years time, and the curve of the following ascent takes a different shape as well. Even in the 6th year of the trough of this wave no data indicate that there might be a return back to the previous level of 2011. The number of applications has slightly increased since 2014, though still nearly a quarter of the applications has disappeared by 2016 compared to 2011. As of the figures of the admitted students, the same tendency is visible. Besides a modest increasing trend of applications, the number of admissions seems to get stabilized close to the minimum of this second circle. This is hardly higher than the deepest point of the 16-year long period, namely, the same data of 2007. It is also worth mentioning that the proportion of the state-financed students is somewhat higher in the all admitted, though their allocation has changed significantly.

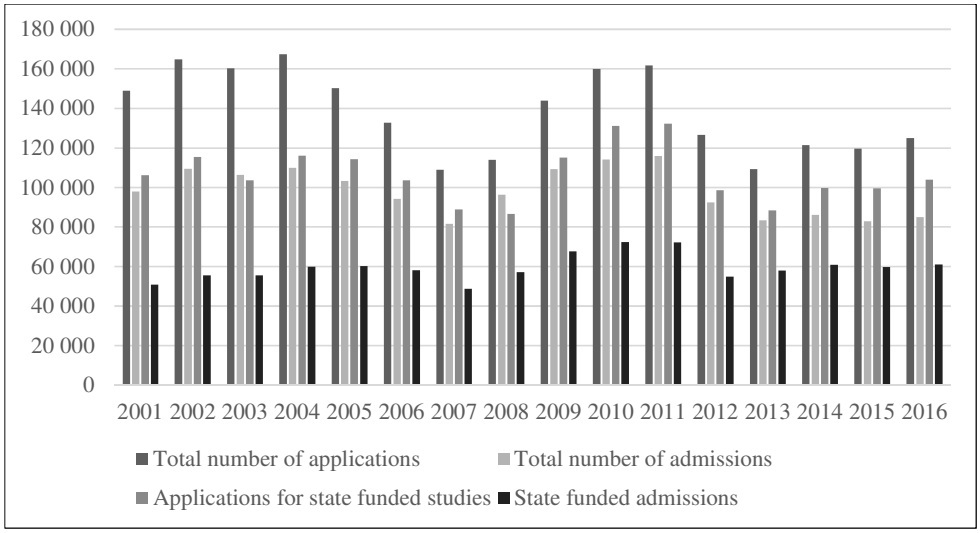

Figure 1 – Distribution of Applications and Admission in Hungary (2001-2016)

So remarkable change(s) took place from 2011 to 2012 that HE lost more than 20% of applicants from one year to the other and an additional more than 10% by 2013. From 2011 to 2012 more than 35,000 fewer students applied for Hungarian HE programmes taking only first-place applications into account. The deepest point of the second wave was in 2013, and the 'upswing' in the number of applications and admissions means only that in 2016 the number reached a value that barely surpassed the lowest level of the longer (2001-2016) period. The number of admissions was only 4% higher than the all-over minimum of a 16-year cycle in 2007.

3.2 Analysis of First-Place Application Data According to Fields of Study (2010-2016)

If we examine the first-place applications according to their distribution among the fields of study, an 'inverted J- shaped' curve appears in the majority of cases in terms of total applications during the same period of time.

Fig. 2 clearly shows that there are only three fields of study where the number of first-place applicants in 2016 is higher or about the same as the corresponding number of 2010. The field of public administration, police and military trainings (where a typical 'inverted U- shaped' curve can be identified indicating a decreasing trend); the pedagogic programmes, where after hitting a bottom in 2012, the number of applications has grown in a way that they have exceeded the high values of 2010; as for medical training and health sciences programmes, the curve resembles a 'flat U- shape'. During this period, a slight decrease can also be recognised in the number of applicants, but not as much as in the case of other fields. By the end of the period, the number of applications essentially returned to that of the beginning, even if not to the peak.

Fig. 2 explicitly illustrates that the changes affected almost every fields of study to different extents. A general loss of applicants in the whole sector can also be observed in the examined period, though, some fields of study were more affected by this phenomenon than others.

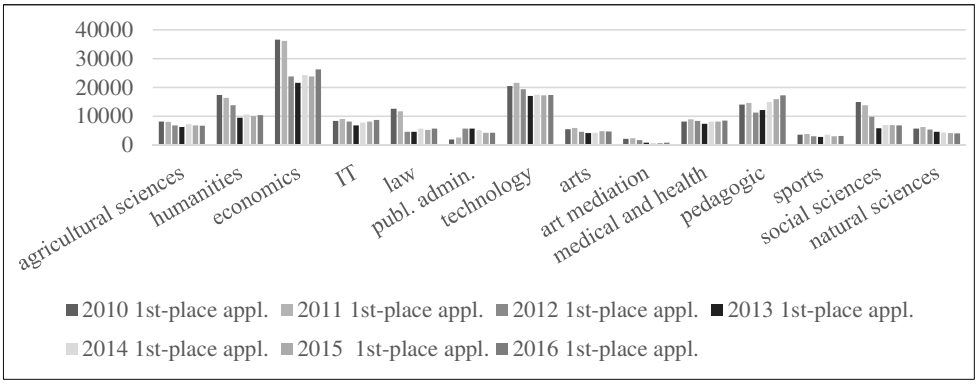

Figure 2 – Changes in First-place Applications According to Fields of Study (2010-2016)

Upon the average numbers of first-place applications, the following 'popularity list' can be set up: (1) economics programmes, (2) technology programmes, (3) pedagogic programmes, (4) humanities programmes, (5) social sciences programmes. These fields have produced first-place application averages above the all-over average of 9,426 for all the fields of study within 2010-2016 (the only exception is the field of social sciences, where social services studies merged into this field in 2013. Without counting with social services, the first-place applications to the studies in social sciences would also enhance the all-over average).

To have a quick impression on where we started and where we currently are, the simplest way is to grab the change in the numbers of first-place applications as a simple difference between the applications in the initial year (2010) and the final year (2016) of the analysed period. Using this method, the difference is 35,052 potential students, that is 22% of first-place applicants of 2010, which is a huge

number. As no apparent demographic reasons can be identified during this period, it can be stated that in 2016 every fifth applicant has not even tried to enter the Hungarian HE system compared to 2010.

If the differences between the numbers of first-place applications from 2010 to 2016 are also examined, it can also be seen that except for pedagogic programmes the most favoured ones (and law programmes in addition) suffered the biggest losses.

Fig. 3 depicts that by 2016 five fields of study had to endure an over-average loss of applicants. For the most part, these fields are identical to those of the aforementioned 'top list': economics programmes are clearly 'leading', where the loss of first-place applications from 2010 to 2016 was more than 4 times above the average, followed by social sciences, humanities, law and technology programmes. Thus it can be concluded that the most popular fields of study with the highest number of first-place applications and law programmes 'took a far bigger share' in the decrease as of the numbers of applicants. There was a slight (4%) increase in the number of first-place applicants in information technology programmes between the beginning and the end of the period. After the general low point of 2012-2013 (which affected the information technology field the least as of absolute numbers) this field of study was able to retrieve the number of its applicants and produced a slight increase.

There were only two fields that experienced a significant increase in applications: pedagogic programmes and the fields of public administration, police and military training (however, it is important to remember the fact that this particular field shows a 'reverse U-curve' instead of the typical 'reverse J' one. First the number of applicants increased, then decreased in the designated period, thus not having been able to hold on to the increasing inclination to apply at the beginning and middle of the period).

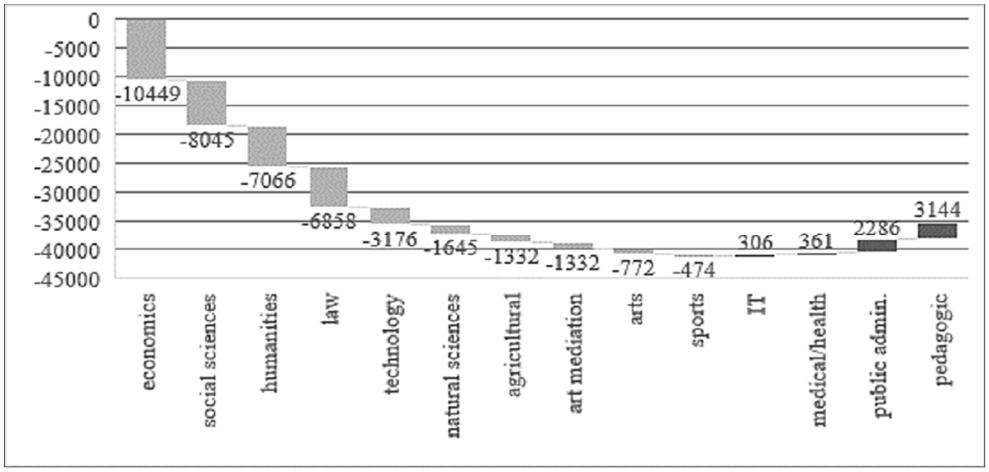

Figure 3 – Differences in the Numbers of First-Place Applications between According to Fields of Study (2010-2016)

3.3 Analysis of Admission Data According to Fields of Study Between 2010-2016

After analysing applications, the data of students admitted into HE are examined.

Analysis of All Admitted Students (2010-2016)

As expected, Fig. 4 demonstrates that the curves that are characteristic of those applying for HE look very similar to those of the students who were finally admitted. Compared to 2010, the number of admissions was approximately 29,000 less in terms of student numbers in 2016.

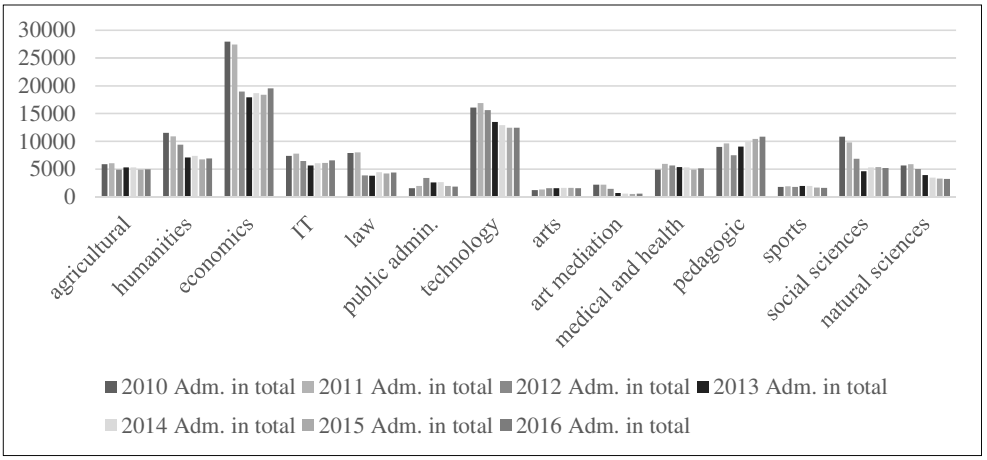

Figure 4 – Number of Admitted Students According to the Fields of Study (2010-2016)

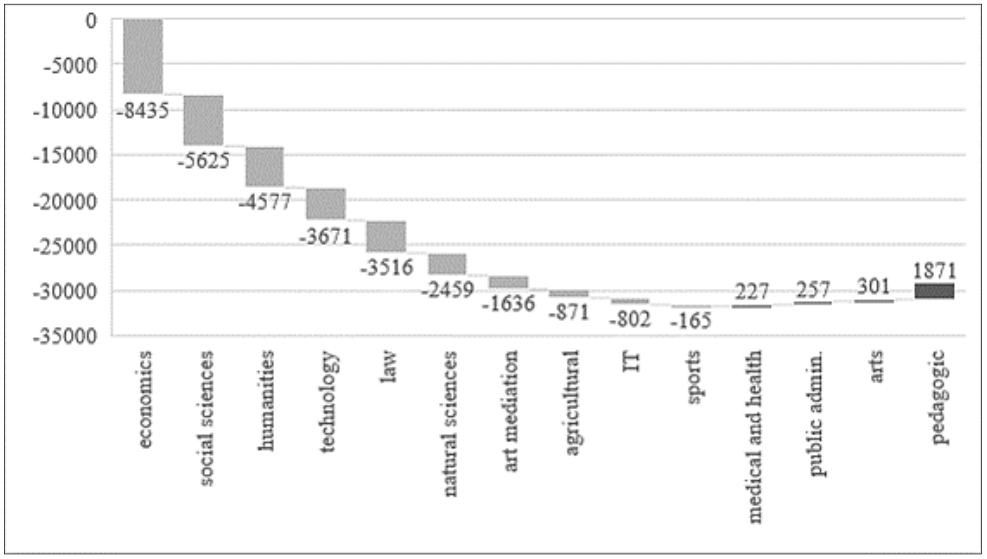

Figure 5 – Difference in the Number of Admitted Students by Fields of Study (2010-2016)

There is a 'top list' that is identical to the one based on the analysis of first-place applications by examining the average number of admissions in the period of 2010-2016. Not surprisingly, the admission numbers of the most popular fields dropped back most considerably, though in a bit different order. So the 'top list' of those losing the most students is almost the same as of applications, with law 'coming up' and without pedagogic programmes, which eventually increased (Fig. 5).

When comparing the differences of first-place applications and admissions, Figure 6 shows that the cut in the number of applications was normally followed by a decrease in admissions by a lower extent. While the drop of first place applications was 35,052 students, the fall in the number of total admissions is by 29,101 students less (17%) from 2011 to 2016. This seems reasonable, since the capacities of HEIs have not changed that much as the interest of the potential students. So it seems rational that among fewer applicants, institutions enrol as many students as reasonably possible. Despite all expectations, the number of admitted students to IT, technology, natural sciences and public administration fields decreased at a greater extent than the number of their first place applications (Fig. 6). Compared to 2010, by 10% fewer students were admitted even in the case of IT studies, meanwhile the number of first-place applications increased by 4% (we also have to mention that in 2016 there was a 7% increase in the number of admitted students to IT studies, compared to the previous year, otherwise the decline would be even more out of ordinary). Another unexpected trend can be caught at technology education. At this field there are also visibly fewer admissions than the decrease of applications. This seems really weird and is contrary to the general trends and policy intentions. A reasonable explanation to this phenomenon can be that institutions in technology education (in average) raised their quality requirements irrespectively of the decreasing student interest.

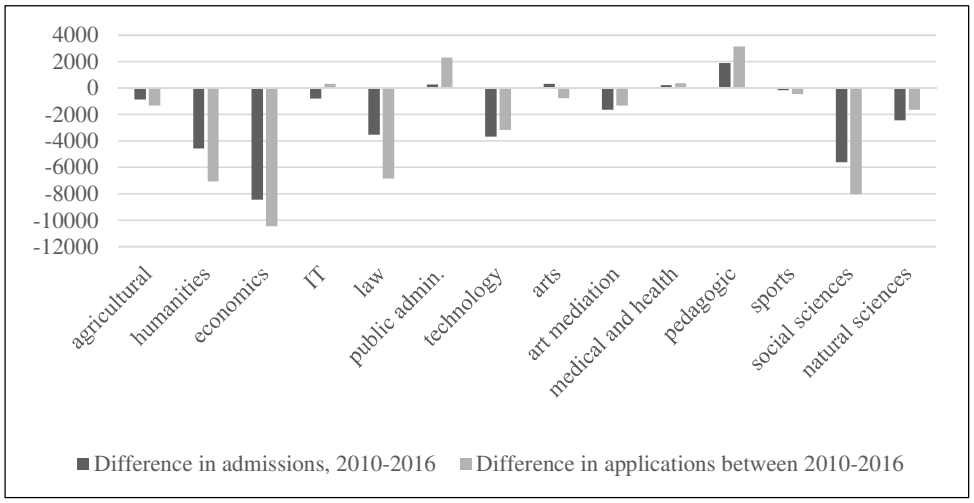

Figure 6 – Comparison of Differences in First Place Applications to Admissions (2010-2016)

After examining the absolute numbers, where one can experience huge decreases, the changes of the proportions of admissions at the fields from 2010 to 2016 developed absolutely unexpectedly (Fig. 7). The biggest change can be observed in case of pedagogy showing a 4.9% increase, while the negative 'recorder' was the field of social sciences with a 3.4% decrease in its proportion of all admissions. All the other fields are in between 1.7% and -1.9%. These data do not show any significant rearrangements amongst the fields. Except for the two above mentioned, proportions of admitted students returned close to their original levels. Even though data fluctuated during the in-between years, it can be stated that nothing really changed remarkably as of the weights of the fields. Life returned to 'business as usual', expressing almost the same student preferences.

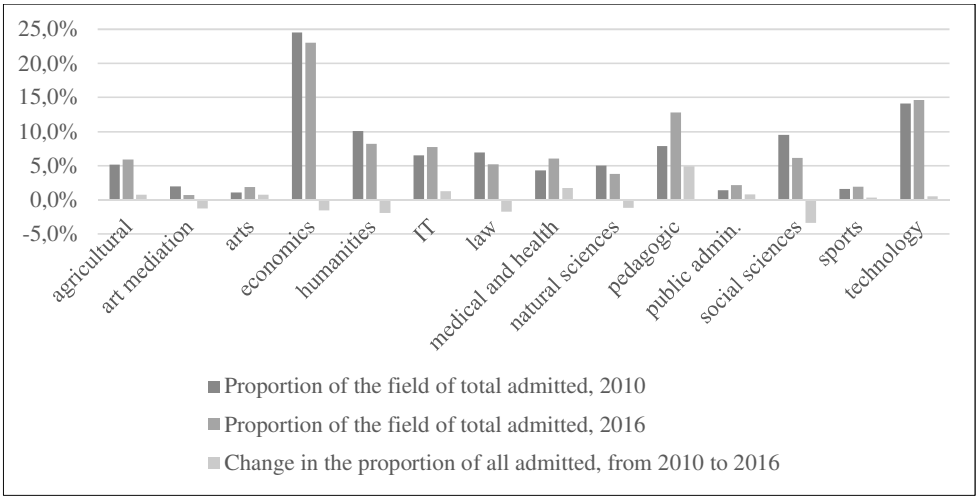

Figure 7 – Changes in the Proportions of Fields of Studies of All Admitted Students (2010-2016)

Analysis of Admitted Students According to Finance Status Between 2010-2016

All the above mentioned is even more interesting, if trends of distribution of state-funded places among fields of study are also investigated (Fig. 8).

It is apparent from Figure 8 that the number of state-funded places in economics, social sciences and law programmes suddenly fell down, and so did the number of students applying (as seen on Figure 2) and admitted into these programmes (as seen on Figure 4). This is in accordance with the pronounced aim of the policy makers to significantly cut the number of these graduates. It is also visible that the number of state-financed students is also falling at the field of technology, however, it is surely not intended by policy makers. Taking Figure 4 into account again, this decrease is in parallel with the decrease of overall admissions at the field. Fewer students become state-funded from year to year, since the number of admitted students is also going down.

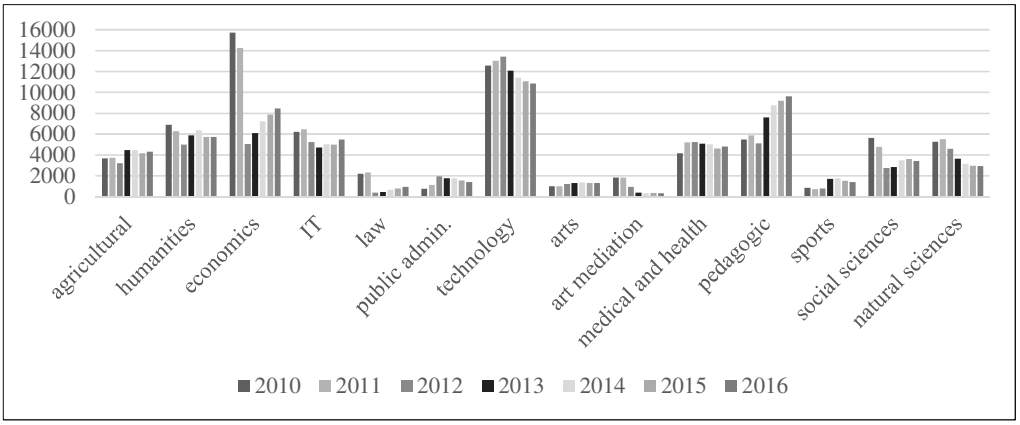

Figure 8 – State-Funded/Scholarship Admissions (2010-2016)

Fig. 9 clearly presents that two fields of study have far higher rate of fee-paying students than the others. In case of law programmes this rate is extremely high. On average, about 80% of admitted students were paying tuition fee in this time period, but in 2012 this number even reached 90%. In the field of economics programmes, an average 58% of students paid tuition fee, reaching its peak in 2012 with 73%. Meanwhile, field of economics started to regain its state-financed places. Compared to 2010, field of economics lost almost 8,500 admitted students, mostly of state-financed ones, while in 2016 the loss in fee-paying students was only less than 10% compared to that of 2010. It can be concluded that the field of economics has been really successful as this field has been able to keep its fee-paying students.

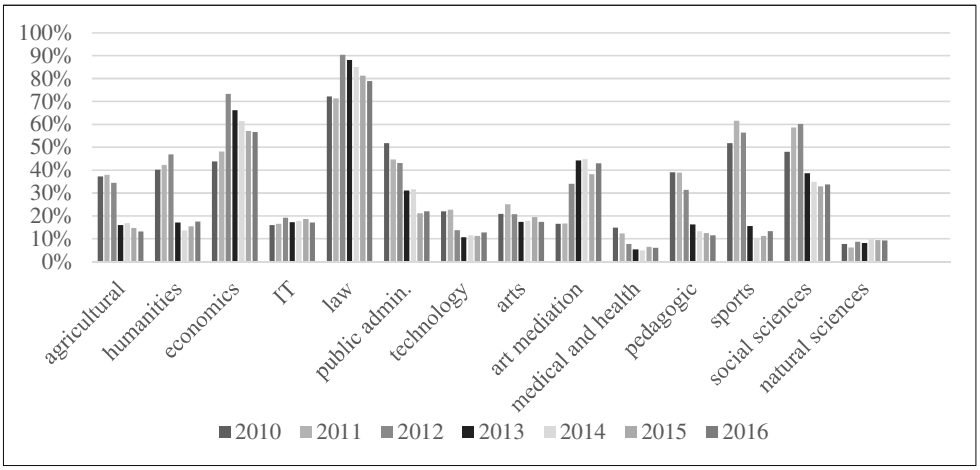

Figure 9 – The Proportion of Fee Paying Admissions in All by Fields of Study (2010-2016)

The third area where fee-paying students are far above the average is the social sciences, which is 'the silver medallist' on the list of the fields of studies losing

the most students. Before changes in Hungarian HE started, the proportion of fee-paying students in the field of social sciences had been significantly higher. However, it has lost more than 1.5 times more of its fee-paying students than state-financed ones. Due to that trend, the proportion of state-financed students are obviously greater in this field. So this change is not the result of increasing state-financed places, it is rather about losing more fee-paying students.

3.4 Analysis of the Distribution of Admissions by Age Group

Besides fields of study, the age composition of admissions and its change is also worth investigating (Fig. 10).

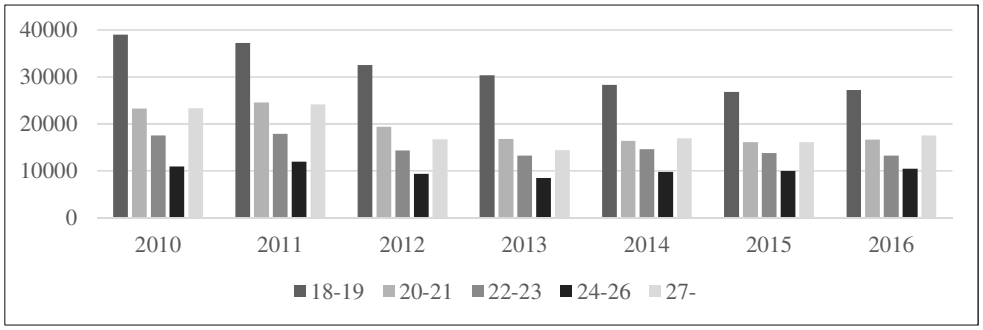

Figure 10 – Change in Admissions by Age Groups (2010-2016)

Figure 10 presents that the largest overall decrease in the number of admissions is caused by the drop in the age group freshly leaving secondary school, namely, by the 18-19 year-old applicants. Looking at 18-19 and 20-21 age groups together, the proportion of this younger generation is even higher in the decrease (63%). The higher proportion of younger (18-21) age groups' loss of interest has had damaging effect on BSc and undivided programmes, where 92% of the lost students belong to these two age groups. Although the decrease of all students admitted to BSc/undivided programs are only 40% of the total fall, this tendency obviously has and will have an effect on the number of newly entering master level students some years later.

3.5 Analysis of Minimum Admission Score Limits in the Time Period of 2010-2016

Acknowledging data limitations mentioned in Chapter 2, this analysis is based on the programmes of the largest Hungarian HEIs (or on the more notable ones in terms of the specific field of study). We have examined the fields of economics, law, social sciences, technology, IT, and natural sciences programmes, and the average minimum admission scores. By analysing the data, some really unexpected and out of ordinary trends can be observed.

In the case of economics programmes, the number of applications bottomed out including first-place applications and admissions. At the same time the number of state-financed students also hit a low. The number of these places is increasing again, however they are still far from the original level at the beginning of the time period. Meanwhile, the field could keep most of its fee-paying students. Given these circumstances, the field of economics has managed to retain its absolute winner position with the largest number of applicants and admitted students. Contrary to all of our expectations, minimum admission score limits of bachelor programmes have also risen in the case of fee-paying places. Such a phenomenon would not be surprising in the case of state-funded places, since one obviously needs to have a higher score to get into a programme with fewer state-funded places. However, the number of state-funded places has begun to increase after the bottom of 2012, admission score limits are still constantly standing high. Excellent students compete for the limited number of state-funded places. Except for the state-funded bachelor places, where the entering score limit has been standing at its rational maximum, entering score limits for fee-paying students has continued to rise, however, their number to some extent has gone down due to the increasing state financing. At master level the entering scores for fee-paying and state financed education are almost equal without any significant difference. In other words, institutions have not attracted students by lowering the requirements of admission. As a result, the rise in student number at the field of economics is clearly due to students' growing interest.

In the case of BSc and undivided programmes in the field of law, there's a very similar tendency. The limited number of state-financed places results in constantly high entering score limits, however, the scores for the fee-paying students are continuously increasing. In the field of social sciences studies, the only difference is that the BSc and BA state-financed entering scores are not as high as in the case of economics and law, though, they are slightly going up as well.

An interesting phenomenon can also be observed in the field of technology programmes taking the constant decrease in student numbers into consideration. On average, admission score limits for fee-paying programmes have proved to be higher than state-funded ones in every year and on every level since 2013 in the average of the examined higher education institutions. There has been a continuous increase in the score limits for fee-paying programmes. What even more interesting is that the decrease in student numbers seems to originate from the decrease of the state-financed students, where the minimum is entering scores, especially at BSc/BA level, is also rising (While admission numbers and state -financed admissions are decreasing). The same trend can be observed in the field of IT programmes. On average, the fee-paying score limits of these programmes exceeded the state-funded ones every year on both levels from 2012 in the examined higher education institutions. The entering minimum score also shows an increasing trend since 2012 in case of state-financed students.

The change in admission score limits of natural sciences programmes is not as expected either. This field suffered an overall decrease in the number of applications, including first-place applications and admissions. On the contrary, the entering minimum scores at both levels of education and in both financing forms have been continuously increasing.

4 CONCLUSION

It may be assumed that in the absence of other known relevant socio-demographic reasons the change in the habits of HE applicants has been induced by the announced state goals and trends; that is what the applicants have been reacting to. It can be assumed that student strategies responding to state and political changes have stabilised. By 2016, Hungarian HE applications and admissions have begun to settle at a certain level, showing fluctuation around a certain value.

Examining student reactions, it may be assessed that the governmental policy to promote technology, IT and natural sciences studies and constrain applications to economics, social sciences, humanities and law programmes have mostly not been effective, at least not in this timeframe. Economics programmes still continue to be the 'gold medallist' of popularity lists. There is no sign of any kind of rearrangements even starting to take shape, apart from the fact that pedagogic programmes have come slightly forward. It may be assumed that this increase has come from lost students in humanities and social sciences fields. During the examined time period six classes of students graduated from secondary school and had the opportunity to change their preferences and their chosen fields from 2011. They did not. It is also remarkable that almost a quarter of HE applicants are older than 27 meaning they have already established their preferences.

Hence, changes in political aspects certainly cannot be ignored, the key question is whether the quality management of a HEI is able to correctly identify student needs and expectations and whether it can effectively address those needs. Can a HEI effectively utilise state-of-the-art methods of quality management? What can they do to convince as many students as possible that it is worth entering HE, applying to a particular institution or programme even among these conditions? In a situation similar to Hungary's, this may well be the key to the survival of a higher education institution.

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Cultural Change of Applying User Involvement for Improving Healthcare Quality: A Review of the Impact on Attitudes, Values and Assumptions among Healthcare Professionals and Users

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ABSTRACT

Purpose: The purpose of this study is to provide a review of the impact on culture (attitudes, values and assumptions) among both healthcare professionals, as well as users, when involving users for improving quality in healthcare.

Methodology/Approach: The paper is based on an extensive, narrative literature review considering studies that included professional's and users experiences of user involvement in quality improvement. The included articles were analyzed using an interpretive, along with a deductive, approach according to a theoretical framework.

Findings: The results indicate that there is currently limited research focusing on the impact of user involvement in quality improvement processes regarding professionals' and users' attitudes, values and/or assumptions. The articles identified during the study provides situations and statements, during the process of development, which can be interpreted as change in the culture. Although few articles specifically draw conclusions on user involvement as a "tool" for cultural change, the authors interpret several findings which strengthens that theory.

Research Limitation/implication: Research published in other databases could have been missed. The authors have tried to avoid this by using a snowball method reading references in identified articles.

Originality/Value of paper: The review provides a platform for both future research and the development of current practice within the area. There have been literature reviews showing obstacles and enablers when using patients, users and relatives in quality improvement work, but few which investigates cultural change.

Category: Literature Review

Keywords: patient involvement; quality improvement; professionals; culture; service design

1 INTRODUCTION

Swedish healthcare, along with the western world healthcare systems in general, is currently facing major challenges and will probably not be able to produce enough healthcare in proportion to demand (Nordgren, 2009). People live for example longer, which increases the incidence of chronic diseases and drives the need for improving and developing accessibility and quality. A majority of the current healthcare resources, in terms of financial resources as well as personnel, are furthermore earmarked for patients with cancer, diabetes or cardiovascular diseases (The Swedish Agency for Health and Care Services Analysis, 2014). The Swedish Association of Local Authorities and Regions (SALAR) (2010), stresses in a letter of intent that the higher level of education among patients, technology development, and the simple access to information also tend to increase demand and expectations on healthcare services. Another trend that must be faced is that many people prefer and have come to expect a tailored solution in contact with service organizations (Quist and Fransson, 2014). Healthcare organizations are not generally structured to handle this demand for customization (Glouberman and Mintzberg, 2001a; SALAR, 2010).

Quality Improvement (QI) initiatives in healthcare often claim to have the customer or patient in focus (Bergman and Klefsjö, 2007). But despite the awareness that patients have the knowledge and overview of their own process, they are seldom a central part of the actual development process and the profession lets them assume a consultative rather than a decision-making role (Elg, et al., 2012; Gagliardi, et al., 2008).What is more, they are often not seen as a significant actor for the development of the health care services quality improvement activities (Groene, et al., 2009). On the other hand, Service Dominant Logic (SDL) stresses that if you really want, not only to have customers in focus, but to really get the patients focus to understand how improvements of the process leads to value, you can use service design thinking and methods (Quist and Fransson, 2014; Roberts, et al., 2015).

Methods and tools from service design have also shown a potential to make patients more active contributors of knowledge and skills for the quality improvement of healthcare services (Elg, et al., 2012). Currently, many projects are also initiated using this kind of approach within healthcare see e.g. (Elg, et al., 2012; Gustavsson, Gremyr and Sarenmalm, 2016; Lavoie-Tremblay, et al., 2014; Locock, et al., 2014; Piper, et al., 2012). However, this research has focused mostly on the forms, and how to use service design methods or tools, not on the impact on healthcare culture. One exception is Crawford, et al., (2002) systematic review on research of involving patients in the planning and

development of healthcare, between 1965-2000, highlighting some effects on attitudes and mostly in mental health service. However, many sources of recent research (Brooks, 2008; Luxford, Safran and Delbanco, 2011) do highlight the need for change in healthcare culture in order to create favourable conditions for patient participation. Hence there is a need to specifically review the impact of various forms of user involvement on organizational and professional culture and attitudes. This is of special interest as the culture and attitudes towards user involvement undoubtedly have the potential to support as well as hinder future applications of service design thinking and tools for improving quality in healthcare as argued by e.g. (Armstrong, et al., 2013; Brooks, 2008; Lavoie-Tremblay, et al., 2014).

2 ORGANIZATIONAL AND PROFESSIONAL CULTURE

To describe culture, this paper acknowledges Schein's (2010, p.18) definition stating that:

"The culture of a group can now be defined as a pattern of shared basic assumptions learned by a group as it solved its problems of external adaption and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems."

In doing so, the essence of culture is seen as consisting of basic assumptions which are deeply embedded and unconscious in contrast to those artifacts you can observe with your senses, when you encounter a new group with an unfamiliar culture.

The manifestations of culture at different levels can also be understood with the "onion model" (Hofstede, Hofstede and Minkov, 2010, p.8). The different layers consisting of *values, rituals, heroes* and on the most superficial level are the *symbols*. The three outermost layers could be visible to an outside observer through *practices*, but their cultural meaning is invisible and only understood in the way these practices are interpreted by the insiders.

Professionals, like organizations, can develop strong cultures. According to Schein (2010) this is especially seen with highly educated professionals with strong connection to their work. These groups are defined with specific standards, values, fundamental beliefs and regulations. This will, consciously or subconsciously reflect on their approach, attitudes and behavior. These professional subgroups create a system containing a lot of specialized and strong cultures which inhibits a cooperative culture. Creating a common culture can be managed if people share beliefs and values. Then the different groups can coordinate their efforts (Glouberman and Mintzberg, 2001b).

Changing culture generally tend to demand will and motivation, which several management theories describe (French and Bell, 1999). Change, planned or

unplanned, is then referred to as something that can be described as a new state of things compared to an old one. Changing culture can be understood by Schein's (2010) three-stage model of the change process that is built on Kurt Lewin's three stage model and ads psychological mechanisms to each step. *Unfreezing* in order to create motivation and readiness to change. Changing through *Cognitive Restructuring* by helping the client to experience, judge, and react to things differently based on a new point of view. And finally *Refreezing* through helping the client to integrate the new point of view. Burke (1994) also juxtaposes culture with change, stating that transformative change should focus on changing the employee's behaviors thru developing the organization's aims and strategies, it's leadership and the culture, in order to achieve deep and sustainable change. This will mean that members of the organization must unlearn something as well as learning something new (Schein, 2010).

In order to understand the complex healthcare system concerning obstacles for cooperation Glouberman and Mintzberg (2001a) identifies four "worlds" of healthcare and the characteristics within them as seen in Fig. 1. The figure distinguishes where and in what direction management is practiced. The horizontal cleavage in the system divides those who operate clinically "down" from those who work "up". The vertical cleavage divides the nurses and managers who are close to the institution, from the physicians and trustees, which are involved but not so formally committed. Glouberman and Mintzberg (2001a) further emphasize that unless the organizations (healthcare) find ways to establish connections between these worlds, nothing fundamental will change.

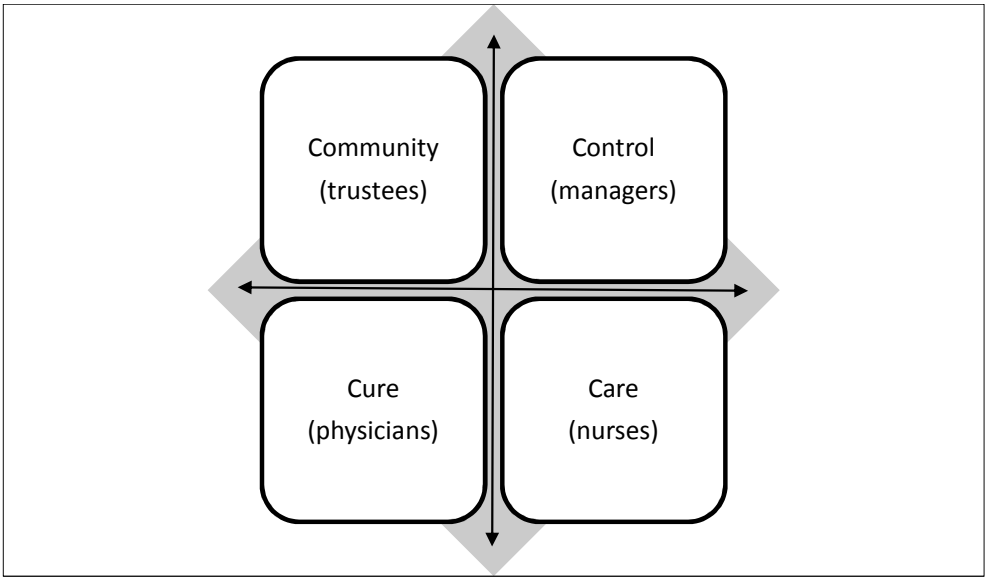

Figure 1 – Four Worlds of the General Hospital inspired by Glouberman and Mintzberg (2001a, p.57)

The purpose of this study is to provide a review of the impact on culture (attitudes, values and assumptions) among both healthcare professionals, as well as users, when involving patients for the improvement of quality in healthcare.

3 METHODOLOGY

The literature study of this paper was inspired by the extended narrative review as presented by Bryman (2011). The review considered studies that included professional's experiences of user involvement in quality improvement along with studies that described the impact on healthcare culture. The included articles were analyzed using an interpretive along with a deductive approach according to theories from organizational and professional culture.

3.1 Search Strategy

The search strategy aimed to find studies performed in a healthcare context. By using Mesh-terms and Thesaurus such as "patient participation", "consumer participation", "client participation", "organizational culture", "attitude of health personnel", and "quality improvement" as well as keywords such as "impact", "service design", and "change management" in the databases Pubmed, Cinahl and Psychinfo, a total quantity of 3,786 articles were found.

3.2 Selection Criteria

Inclusion criteria were a focus on user/patient involvement, and that the articles had described user involvement at least on the level of partnership according to the Arnstein ladder of participation (Arnstein, 1969). Further inclusion criteria were a connection to quality improvement activities, full text access, english language, peer-reviewed and published between 2000-2016. Clinical trials, shared decision making (SDM), education and descriptions of other personnel outside a healthcare context were excluded.

3.3 Analysis

The first author started the analysis by reading all of the article titles. A second selection was then made by reading the abstracts of all the remaining articles, which led to 83 articles where full text was read as seen in Fig. 2. During this review, 12 additional articles were found using snowball methodology. The first and second author then also read the remaining 24 selected articles to discover which described impact on cultural change. All of these articles were rated, discussed and compared in relation to the purpose of the review. As a result, six articles were finally selected for a detailed thematic analysis in accordance to Patton (2014).

The first and second author then contracted sentences, sets of sentences and citations which were coded and then interpreted into three categories (attitudes,

values, and assumptions) and in a chronological order (before, during, and after the different user involvement activities).

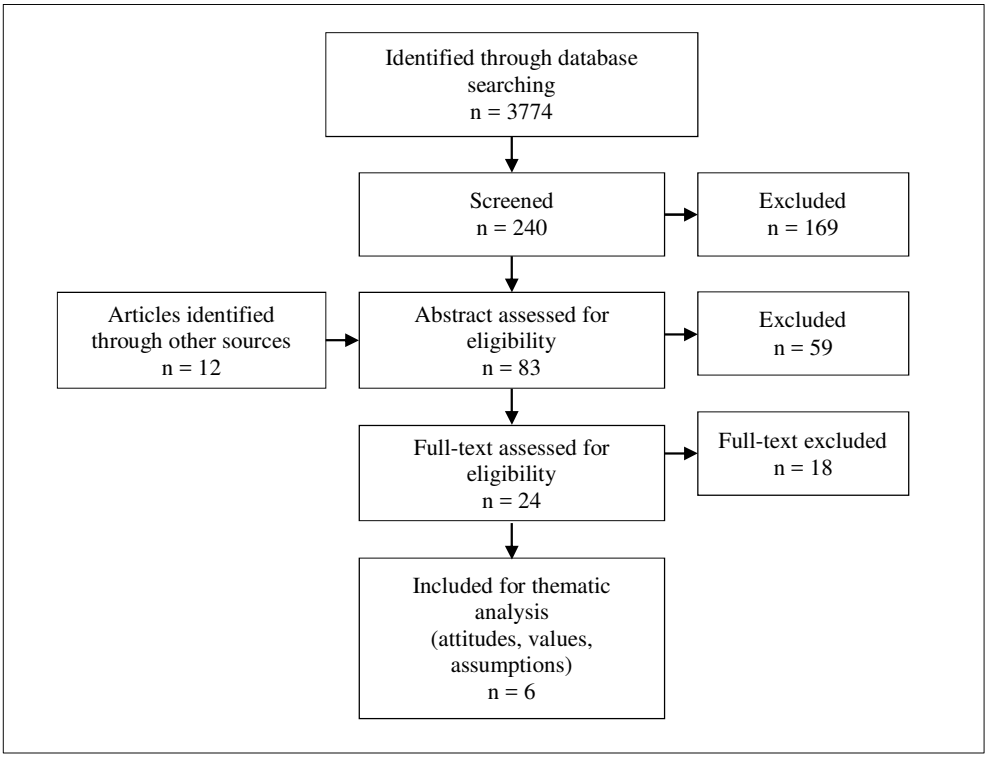

Figure 2 – The Methodology of the Literature Study, Systematically Narrowing Down the Selection of Identified Articles Stepwise

4 RESULTS

As a result of the review process, the content of the selected articles was summarized in a chronological order in relation to user involvement activities, as presented in the sections below. The collective picture is emerging from the analysis of the articles concerning the journey before, during, and after involving users in health care quality development, could very well be referred to as "a journey from resistance to appreciated insights".

4.1 Before User Involvement: We Know!

Initially, the articles suggest that there are signs that the professionals see themselves as carriers of knowledge. They also tend to assume that their knowledge is superior to that of the users'. This is exemplified in users describing their presence in various development teams, only to say yes, or agree, to conclusions already drawn up and presented by the healthcare personnel. *"It sounds as though we are here to say ok to the trust decisions (hospital), agree*

with them" (Brooks, 2008, p.8). And the professionals tend to express that the "patients councils" wouldn't necessarily know enough about the needs in the healthcare organization. In sum, users comment that they feel that their knowledge is not highly valued in the development processes.

One reason described in the articles concerning why members of the health care organizations should involve users is that they are bound to do so to follow legislations and /or policies, they have to "tic the box". There are doubts as to the user's knowledge and their ability to contribute with their experience. There are also descriptions of professional attitudes when they want to select the "right" patients to participate in the development team and that "their" patients are too vulnerable or that they "soon will die". Professionals thoughts about their own knowledge and competence skills regarding improvement work, justifies the right to decide who is best to participate in involvement activities, which is, on the one hand, strengthened by the expressed feeling from users, of not being trusted with the capability to represent a larger group than themselves. And, on the other hand, the fears expressed among the professionals about exposing their weaknesses: *"Because at first, when I heard patient rep, I'm thinking oh my god! We're gonna expose ourselves, to strangers ... because our practice was so that we work with our team. We work with ourselves. We're comfortable as a health care team. We speak the same language or so we think. That's the perception. So to bring a patient in, you're thinking oh my god! I'm exposing all of myself so they'll see all of my imperfections ... that was at the back of my mind at first, but then once they're there, you're thinking wow! It's great having them because they have input and they have valuable information that you can use"* (Lavoie-Tremblay, et al., 2014, p.43).

In contrast to the descriptions above, there are examples where health care professionals reveal confidence about the user's ability to contribute with new ideas, experiences and competence, that are valuable for the improvement work. *"I think it's a good thing...after all, patients have good ideas…"* (Lavoie-Tremblay, et al., 2014, p.43). Several users also express their possibilities to act as a resource because of their access to knowledge and experiences that the professionals lack and they feel an obligation to *"pay back"* (Cotterell, et al., 2011, p.163).

4.2 During User Involvement: Maybe We Can?

The articles also describe, that during development work in which users were involved, there was an ambiguity as to what is expected in the cooperation. Both users and professionals showed signs of "not knowing" how to behave, act in relation to each other, and the roles seemed unclear. The professionals also depict the users as threatening, annoying and ungrateful and the users felt that there seemed to be insignificant experience of handling criticism within the professional's organization.

One project displayed better experiences in the cooperation but they had also selected user representatives that they already knew had a positive attitude towards their organization. Other professionals expressed that interaction with users who had personal expertise and knowledge of healthcare (former healthcare workers) would be preferred as a team member.

The articles also provide clear descriptions of professionals using various power techniques, such as silence about uncomfortable topics, trying to lead discussions back to their agenda, and the use of bureaucratic language. Users feel that some discussions are superficial and signs of tokenism are significant (tick the box). There was also a clear sense of the hierarchic structure *"it puts a barrier up, an unconscious barrier….Their name, rank and serial number"* (Forbat, et al., 2009, p.88).

Over time the cooperation tends to develop into more of an understanding of each other's contribution. Users felt for example that the professionals started to value their experiences and stories as important knowledge for the improvement work. There were examples were professionals preconceptions about difficulties with user involvement proved groundless and they increased their understanding that user participation matters.

The different projects also gave examples of greater insights on how power relations and hierarchical structure affected users ability to participate on equal terms, *"There was a real move forward. I felt that there was trust"* (Martin and Finn, 2011, p.1059). Furthermore, participation in the improvement work also created a sense of empowerment and as a supporting activity to the user's recovery process (cancer patients). *"It isn't a support group but my God it's a support group (laughter)"* (Cotterell, et al., 2011, p.165).

4.3 After User Involvement: They're OK!

At the end of user involvement projects, a majority of the analyzed material, stresses a lot of descriptions of how the professional's view of user involvement had changed. Long term skepticism had often developed into a trustful relationship. The professional's attitudes to the patient perspective also affected the ability to resolve potential conflict situations during cooperation in a positive way. Both groups expressed a better understanding of the complexity of cross functional teamwork. Users experiences tend to contribute to a shift in power relations as the professional now saw the value of the user's stories and gained an insight that they couldn't argue against. *"I think we naively sort of missed a trick there because I, we, took it the wrong way, we said that some of our patients had an obsession about linen or something, and we didn't know why until we did the storytelling. It isn't an obsession, it is a desire to put things right. Those stories had a real impact on me, I have been in nursing 17 yr. and never heard them before"* (Brooks, 2008, p.10).

More details about the specific involvement methods used, the participants involved, and the specific findings regarding cultural change from each article is seen in Tab. 1.

Table 1 – A Specification of the Involvement Methods Used, the Participants Involved and the Specific Findings Regarding Cultural Change from each of the Six Articles Selected for the Detailed Thematic Analysis

Author, Year	Title	Country	Involvement method	Partici-pants	Findings regarding Cultural Change
Armstron, et al., 2013	Optimizing patient involvement in quality improvement	UK	Service user participation in strategic level health care decision-making	Users, Physician, Nurses	Citations from personnel and users about feelings and experiences Rationales to involvement Observations of behaviors
Brooks, 2008	Nursing and public participation in health: An ethnographic study of a patient council	UK	Service user participation in strategic level health care decision-making	Users, Nurses	Citations from personnel and users about feelings and experiences Nurse-Patient partnership Communication strategies
Cotterell, et al., 2011	Service user involvement in cancer care: the impact on service users	UK	Service users affected by cancer were engaged in involvement activities in cancer service, care and research	Users	Citations from users about feelings and experiences Value aspects
Forbat, et al., 2009	Engaging patients in health care: An empirical study of the role of engagement on attitudes and action	UK	Lung Cancer teams engage with patients and family members (supported collaboration) for 6 months	Users, Physician, Nurses	Citations from personnel and users about feelings and experiences Attitude change Tokenism
Lavoie-Tremblay, et al., 2014	The perceptions of Health Care Team Members About Engaging Patients in Care Redesign	Can	Patient representativ es in care redesign teams from start	Users, Physician, Nurses	Citations from personnel and users about feelings and experiences Transformation process

Author, Year	Title	Country	Involvement method	Partici-pants	Findings regarding Cultural Change
Martin and Finn, 2011	Patients as team members: opportunities, challenges and paradoxes of including patients in multi-professional healthcare teams	UK	Patient representatives in management teams	Users, Physician, Nurses	Citations from personnel and users about feelings and experiences Tensions

5 CONCLUSION

Given the purpose of this paper, to provide a review of the impact on culture (attitudes, values and assumptions) among healthcare professionals, as well as users, when involving users for improving quality in healthcare, the results of this literature review contribute with several conclusions.

A first conclusion is that the conducted review reveals a currently limited level of research in this area. Starting out from the initial hits with 3786 articles, in the end only six articles were found that actually covered this topic in a way that could be seen as a cultural change within the professional groups. Even fewer articles could be found that focuses on users/patients experiences associated to attitudes, values and assumptions in cooperation during quality improvement processes in a healthcare context.

Secondly, the results indicate that culture in terms of for example basic assumptions are indeed impacted by user involvement for quality improvement in health care. In applying a chronological perspective, the analysis and results indicate e.g. extensive changes in attitudes among both healthcare professionals and users such as patients. The change of attitudes highlighted in several cases can be summarized as a journey from resistance to appreciated insights. Initially common attitudes of e.g. fear and a lack of trust are often impacted positively and are reduced and even replaced by attitudes such as respect and even appreciation.

The identified articles also underline various impacts of user involvement on other cultural aspects such as behaviors. The change of behaviors resulting from user involvement is presented as a reduction in for example the use of power strategies when healthcare professionals and patients are interacting.

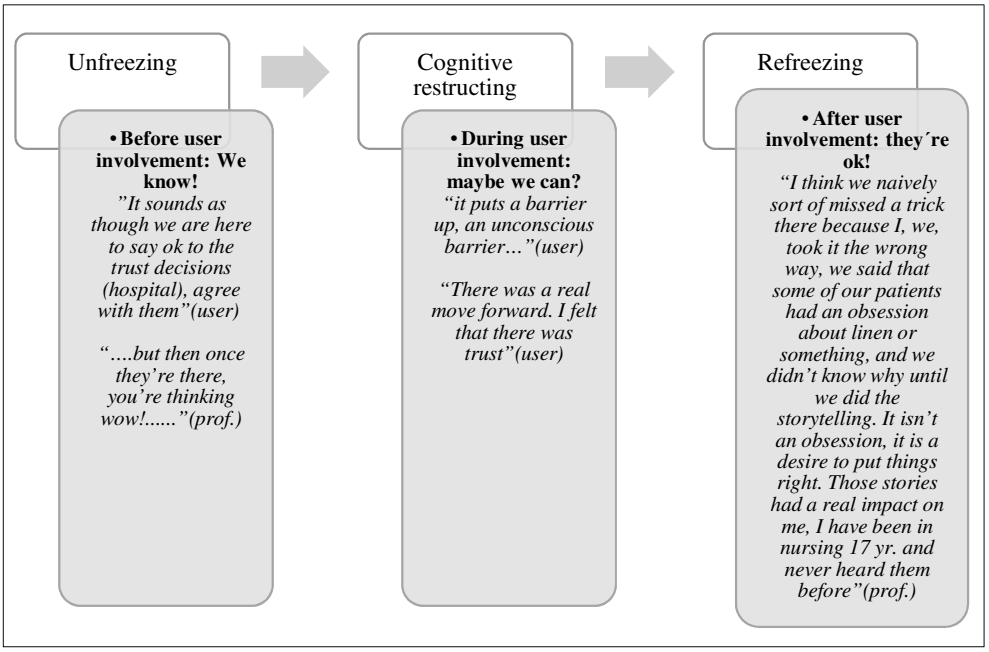

Figure 3 – The Process of Change among Healthcare Professionals and Users in Relation to Scheins Model of Change (Schein, 2010)

6 DISCUSSION AND FUTURE RESEARCH

Putting the results in perspective, the conclusions of this study contributes with a unique review concerning the impact on culture (attitudes, values and assumptions) among the professionals, as well as users, when involving users for improvement of quality in healthcare. Co-creation through a design thinking perspective could manifest the diverse lawyers of culture, from the values/basic assumptions to the symbols/artifacts as described by Hofstede, Hofstede and Minkov (2010) and Schein (2010).

The conclusions furthermore stress that the impact described, in the few identified articles covering the topic, is actually often large and positive. Involving users for improving quality in healthcare appears to be a strong potential driver of cultural change (having an impact on attitudes, values and assumptions) among both healthcare professionals and users. This might be a key to addressing the challenge highlighted in previous research, stating that despite the awareness that patients have the knowledge and overview of their own process, they are seldom a central part of the actual development process and the profession lets them assume a consultative rather than a decision-making role (Elg, et al., 2012; Gagliardi, et al., 2008). Involving users in improvement work could also be one way to create connections between the worlds of "Cure", "Care", and "Community" as defined by Glouberman and Mintzberg (2001a), and by this influence collaboration activities as a feasibility for fundamental cultural change.

Even more generally, the conclusions contribute to an ongoing discourse within quality management concerning as to whether culture or tools/methodologies come first, or even should come first as for example discussed by Tari and Sabater (2004), and Hellsten and Klefsjö (2000).The conclusions of this study suggest that in many cases the desirable culture appear to actually follow as a result of starting to apply tools and methodologies of user involvement in health care quality development.

When it comes to future research, the results found in this review do, as said, clearly suggest the need for future research that focuses on the cultural journey. It would furthermore be interesting to see more research being conducted in a context outside the UK, as most of the previous research identified here appears to have been conducted in the UK. More specifically, future research should preferably consider the culture among health care professionals and users before various forms of involvement and then compare them with the culture emerging after user involvement, from a short and long term perspective. Among the more specific research questions the following would be of great interest for further studies:

- How does user involvement affect future quality improvement programs?
- How sustainable are the cultural impacts of user involvement in healthcare quality development?
- What forms of user involvement have the largest and most sustainable impact on the culture (attitudes, values and assumptions) among the professionals, as well as users?

6.1 Limitations

The review held some limitations as articles published prior to the year of 2000 were excluded and a wider search in other databases outside a healthcare context could have revealed more articles/quality improvement examples to analyze.

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The Reasons for Decertification of ISO 9001: Financial Aspects

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ABSTRACT

Purpose: The purpose of this paper is to analyse the financial performance of organizations that give up their QMS (Quality Management System) according to ISO 9001 certification. Different reasons found for the cancellation of ISO 9001 certification were taken into consideration. The decrease in certification of ISO 9001 standard is, during the past few years, noticeable in many countries. Therefore, there is a need to analyze the phenomena.

Methodology/Approach: The study analyses financial performance of organizations and reasons of ISO 9001 certificates cancellation based on 99 Polish organizations, which gave up certification in years 2012 and 2013. The reasons of certificate cancelation were obtained from the quality managers of studied organizations. Financial performance was estimated on the basis of the ROA indicator value.

Findings: The results show that in the studied organizations, there is a big group of companies that had financial problems. There were 28.8% of organizations that did not have profits at all, and 32.9% with a financial performance, calculated according to ROA indicator value, lower than the average for the industry in which studied organizations were operating. Surprisingly, there is no evident correlation between the reasons of ISO 9001 decertification and financial performance of these organizations.

Research Limitation/implication: The data cover Polish organizations that give up ISO 9001 certification, and they were obtained only from one certification body. Survey data concerning the decision of decertification cover only a two-year period of time.

Originality/Value of paper: The findings of our study might be helpful for the managers of organizations and certification bodies as well as for the researchers

to describe the effectiveness of activities related to QMS implementation, certification and cancellation.

Category: Research paper

Keywords: ISO 9001; ROA; financial performance; decertification; reasons for decertification

1 INTRODUCTION

The implementation of management systems and the certification to their corresponding standards has experienced an enormous success in the management area in the past few years. Quality management systems according to ISO 9001 are the most recognised management systems worldwide. The last ISO survey available (ISO, 2014) shows the importance of this standard worldwide. From 2004 to 2010 there was an increase of ISO 9001 certificates. In 2011 and for the first time in history, there were fewer certificates worldwide than in the previous year. Afterwards, the evolution goes back to a positive trend but with a clear slowdown and even stagnation in the certification of the standard. This seems to indicate that the financial crisis, has had a significant impact in the certification of ISO 9001.

Despite the growth of ISO 9001 certificates during the past few years, recently an opposite trend seems to be emerging (ISO, 2014). There are some studies that suggest and analysed a slowdown in ISO 9001 implementation and certification in some countries (Casadesus and Karapetrovic, 2005; Marimon, Heras and Casadesús, 2009; Franceschini, et al., 2008; Sampaio, Saraiva and Guimarães, 2009; Bernardo and Simon, 2014). There are also studies about the QMS decertification, that analyse global data about the number of new certifications, which analyse trends by country, region, industrial sector and other classifications (Corbett and Kirsch, 2001; Franceschini, et al., 2008; Marimon, Heras and Casadesús, 2009; Llach, Marimon and Bernardo, 2011).

Among the studies that explore the motives of giving up QMS, we found diverse results pointing at different motivations such as the failure of audits (Marimon, Heras and Casadesús, 2009) or the lack of government support (Delmas, 2002; Casadesus, Giménez and Heras, 2001). There are also empirical studies that have analysed in detail the reasons for decertification (Alcalà, 2013; Kafel and Nowicki, 2014; Alič, 2014).

However, decertification is not synonymous with giving up the QMS. According to Kafel and Nowicki (2014), after decertification studied companies still had a functioning QMS. The last paper by Alič (2014), analyses financial performance of Slovenian organizations that give up ISO 9001 certification. According to that research, the cancelation of ISO 9001 certificates is related to a decline in business performance of the organizations measured by ROA indicator. A decline in business performance of the organizations is related to the time passed

after cancellation of their ISO 9001 certificates. The survey did not investigate the reasons for the certificate cancellation but strongly supports that financial problems are one of the important motives to give up ISO 9001 certification.

Taking into account the results of the studies mentioned above, the main objective of this paper is to explore whether there is a relationship between the cancellation of ISO 9001 certificate and financial performance. Due to the lack of studies in this area, we firstly reviewed the literature on the relationship between the certification to ISO 9001 and financial performance as well as on the decertification phenomenon. Then, we used an explorative methodology in order to address this research gap empirically. Our results are presented by classifying the companies that have given up the certificate along with the reasons for decertification and the relationship with financial performance according to the ROA indicator is shown. Finally, some concluding remarks and implications of the study are presented.

2 LITERATURE REVIEW

The effect of certification on the financial performance of the companies is not evident. Some researchers are indicating towards a little relevance of certification to financial performance. Wayhan et al. Points out that ISO 9001 certification does have a very limited impact on financial performance when measured by ROA (Wayhan, Kirche and Khumawala, 2002). On the other hand, there are studies that indicate a positive correlation between ISO 9001 certification and financial performance e.g., Sharma or Santos et al. (Sharma, 2005; Santos, Costa and Leal, 2012). According to Sampaio at al., it is not unanimous that certified companies would be less profitable if they had not implemented their quality management systems (Sampaio, Saraiva and Monteiro, 2012).

The lack of consensus on the relationship between ISO 9001 certification and financial performance is partly due to the fact that there are some concerns and limitations in the measurement of financial performance of companies that certify ISO 9001. The first one is related to the fact that third party certification provides only the information that a company meets the minimum system requirements specified by a quality management system. Thus, it is not a perfect indicator of the real value of the management system. In the same line, there is an ongoing discussion concerning the credibility of the certification bodies (Konefal and Hatanaka, 2011; Djekic, Tomasevic and Radovanovic, 2011).

Moreover according to Aba at al. there is a significant improvement in financial performance over time when implementing a QMS certification (Aba, Badar and Hayden, 2016). Hence, most of the organizations that implement and certify ISO 9001 are in a good financial shape and certification is not a cause of good financial performance after the certification.

Also, the economic cycles may have an impact on the relationship between the implementation of ISO 9001 and the financial performance of companies.

According to Psomas and Kafetzopoulos, ISO 9001 certified companies significantly outperform the non-certified with regard to product quality, customer satisfaction, operational, market and financial performance during the financial crisis (Psomas and Kafetzopoulos, 2014).

Finally, it is important to indicate, that only companies which are early adopters of management systems experience performance gains because of QMS implementation. According to Corredor and Goñi (2011), the greatest impact on performance takes place a one year after receiving external recognition such as third party certificate for implementing the system.

Research on ISO 9001 has typically addressed topics such as motivations for certification, benefits and challenges of certification, net benefits, success factors, barriers to implementation, management practices, etc. However, more recently, a new topic has emerged based on the stagnation of ISO 9001 certification expansion in recent years (ISO, 2014). Thus, the issue of ISO 9001 withdrawal or decertification phenomenon, remains under researched and the impact of decertification on financial performance needs to be further investigated (Cândido, Coelho and Peixinho, 2016).

The decertification phenomenon emerges due to the fact that many companies raise doubts about the future and costs of certification and they mainly continue certification due to external reasons such as improving their external image or due to customer requirements (Bernardo and Simon, 2014).

Several authors (e.g., Alič, 2014; Bernardo and Simon, 2014; Kafel and Nowicki, 2014) present several motivations for which companies decide to abandon the ISO 9001 certificate. The most cited causes include financial problems of the company, high costs of the certificate and the audit, lack of administration support, having already implemented a functioning QMS that does not need to be certified or the remission of the requirement by the customers.

Taking into account these ISO 9001 withdrawal reasons, it is important to analyse the effect that these may have on the financial performance of companies which decide to undertake the decertification process.

3 METHODOLOGY

The aims of this study are to explore the impact on financial performance that motivates organizations to abandon ISO 9001 certification as well as to contribute to the understanding of the new trends emerging in this field, given the decrease of the expansion of ISO 9001 certificates and even the negative evolution in some countries or sectors.

The data concerning the reasons of decertification were gathered from one of the biggest Polish certification bodies. They were obtained from the companies by an employee of the certification body from the customer retention department. The data cover years 2012 and 2013 and were gathered during that period of time.

We have had data considering the reasons, that 168 companies shared information to certification body on the motives of not renewing ISO 9001 certification. Out of the total number of firms, 38 of them decided to change the certification body. Thus, they cannot be considered as decertifying companies. Therefore, we focused on the financial performance of the other 130 companies and their motives for abandoning the standard.

The data concerning financial performance had been selected based on the ISI Emerging Markets database, comprising sources such as Monitor Polski B, HBI – Hoppenstedt Bonnier – Company Database, Dun & Bradstreet Company Database and Corporate Database. According to Polish law, organizations should publish financial statements, but in practice, there is a delay associated with the fulfilment of this obligation. For that reason, not all the data were collected. There were also 12 organizations operating in a public sector (e.g., primary schools), which were excluded from the financial analysis. Availability of financial data was verified for financial years of 2010 till 2013. As a result, there were 73 organizations chosen with available financial data represented by the assets and a net profit in at least one of the financial years. These values enabled the calculation of the financial indicator Return on Assets (ROA). The ROA indicator was calculated according to the formula: ROA = net income/assets with the use of annual financial data.

For each individual organization, information about their main 7 competitors was also available in the database. The competitors were chosen taking into account similarities of different factors such as type of activity, number of employees and amount of assets. On the basis of the main competitors' financial values, the median ROA value was calculated. That value was used afterwards to compare financial performance of the studied organizations with the average values of the industry.

4 RESULTS AND DISCUSSION

4.1 Why Do Companies Decide to Give Up ISO 9001?

Based on the data of 130 Polish organizations certified to the ISO 9001 standard which decided to abandon it, the main reasons of decertification were identified and are presented in Tab. 1. For detailed data on this classification with the reasons associated to each category and the number of firms see Simon and Kafel (in press).

Table 1 – Classification of Decertification Reasons (based on Simon and Kafel, in press)

Reason's classification	Number of firms	Number of firms with financial data
Internal		
Financial/costs	57	30
Reestructuring of processes/efficiency	21	13
Changes in the MSs/certificates	8	6
Top management decision/business termination	6	2
External		
Customer driven	9	2
Corporate group decision	2	2
Changes in the certification body	1	1
Other	26	17
Total	**130**	**73**

4.2 Financial Drivers for Seeking Decertification

Studied organizations were divided into 3 main groups according to the value of their ROA indicator. In first one, ROA value is below zero, which means that organizations have net losses. The second category includes firms for which their ROA value is above zero but below the average value of ROA for similar organizations operating in the same industry. The last group of organizations had a ROA indicator higher than the average for the industry. In Tab. 2, data with the number of organizations in those groups and main reasons of decertification are presented. The ROA indicator was calculated as an average value from the year of decertification and the two previous years.

Table 2 – Classification of Decertification Reasons according to ROA Indicator (Authors´ elaboration)

Reason's of decertification	ROA indicator		
	Below zero	Between zero and average for industry	Above average for industry
Internal	**15**	**16**	**20**
Financial/costs	11	8	11
Reestructuring of processes/efficiency	3	5	5
Changes in the MSs/certificates	1	3	2

Reason's of decertification	ROA indicator		
	Below zero	Between zero and average for industry	Above average for industry
Top management decision/business termination	0	0	2
External	**6**	**8**	**8**
Customer driven	1	1	0
Corporate group decision	0	1	1
Changes in the certification body	1	0	0
Other	4	6	7
Total	**21**	**24**	**28**

The results presented in Tab. 2 confirm that there is a big group of companies that had financial problems. There were 28.8% of the organizations that did not have profits and 32.9% with a ROA value above zero but lower than average for the industry. In total, there were only 38.3% of the organizations that showed a good financial performance. This means that, in general, companies which give up ISO 9001 certification usually have problems with financial performance during that period of time. On the other hand, there is quite a big group of organizations (38.3%), which have good financial performance. It is surprising that it is hard to find a clear correlation between the reasons of decertification and financial performance. For almost all reasons for decertification, there is the same amount of organizations belonging to one of three considered groups.

There is showed data comparing the change of ROA indicator in the year of decision of decertification with the previous year in Tab. 3.

Table 3 – Tendency of ROA indicator before giving up certification (Authors´ elaboration)

Reasons of decertification	Value of ROA	
	Deterioration	**Improvement**
Internal	**14**	**20**
Financial/costs	11	11
Restructuring of processes/efficiency	3	4
Changes in the MSs/certificates	1	3
Top management decision/business termination	0	2
External	**7**	**9**

Reasons of decertification	Value of ROA	
	Deterioration	Improvement
Customer driven	1	0
Corporate group decision	1	1
Changes in the certification body	0	1
Other	5	7
No data	23	
Total	**21**	**29**

According to the data obtained, there are more organizations (58.0%), that improved their financial performance in the year of ISO 9001 decertification than organizations that deteriorated their financial performance (42.0%) in that time. Surprisingly, out of the group of companies that claimed financial problems as the most important reason for giving up certification, 58.8% of companies improve their financial performance. For almost all reasons for decertification, there is the same amount of organizations belonging to one of two considered groups. There are also no statistically significant differences in a financial performance of the studied organizations divided by the internal and external reasons to give up ISO 9001 certification.

5 CONCLUSION

For the most diffused Management System standard worldwide, there seems to be a stagnation in the certification renewals due to different causes. In this paper, there have been undertaken a study of the reasons of ISO 9001 standard decertification with the emphasis on financial performance of the studied companies.

The results show that in the studied organizations there is a big group of companies that had financial problems. There were 28.8% of organizations that didn't have profits at all and 32.9% with financial performance, calculated according to ROA indicator value, lower than the average for the industry in which studied organizations were operating. Those results are similar to other studies, e.g., Alič (2014). Surprisingly there is no evident correlation between the reasons of ISO 9001 decertification and the financial performance of these organizations.

However, one of the surprising results of the study is that there were more companies abandoning the standard with a ROA value above the industry value than companies with a ROA below the industry value or with a negative ROA.

Similarly, there were more decertifying companies with a positive tendency for the ROA over the years of study than companies showing a negative trend.

This conclusion seems to indicate that the best performing companies that had previously been the first adopters of ISO 9001 do not need the recertificate in order to continue operating in the market. This is in line with recent studies that suggest that certification to ISO 9001 was useful in the beginning for many companies to "force" them to implement a QMS. Once the benefits of having an operating QMS in place have been reaped out, bearing the costs of the certification does no longer make sense. Thus, companies that have internalised their QMS, do not need the certificate anymore and may decide to abandon it, keeping the QMS in place (Bernardo and Simon, 2014; Allur, Heras-Saizarbitoria and Casadesús, 2014).

There are some limitations of the study that should be indicated. The data does not cover all Polish organizations that give up ISO 9001 certification and they were obtained only from one certification body. Survey data concerning the decision of decertification cover only a two-year period of time. It is a time when Polish organizations struggled to overcome the effects of the financial crisis. That economic situation could have affected the studied companies. Moreover, the analysis of ROA value as an indicator of financial performance is a simplification of real financial performance.

For future research, it would be interesting to analyse the relation between motives to implement and certify QMS and reasons of giving up certification afterwards. Another possible line of research is to analyse the relationship between the phenomena of decertification and companies' performance taking into account the further functioning of QMS in those organizations after decertification.

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