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# IMPACT OF VIRTUALIZATION PROCESS ON THE COMPETITIVENESS OF SMALL AND MEDIUM SIZED FIRMS

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## **Abstract**

*This article presents an analysis of the impact of virtualization process on competitiveness of small and medium sized firms. The developed methodology for measuring the level of organizational virtualness has been effectively applied to a wide range of businesses, both large and the smallest companies representing traditional and high-technology sectors. Through statistical analysis it has been confirmed that virtualization process has a positive impact on competitiveness of companies. However, not all theoretically assumed pathways of such impact have been observed. Presented results and conclusions of the examination give a new perspective for discussion about challenges of effective implementing virtual organization concept into business practice.*

**Keywords:** virtualization process, competitiveness, virtual organization, SME

**JEL classification:** M20

## **1. INTRODUCTION**

On the theoretical ground it has been assumed that the virtualization process increases the competitiveness of a firm through specific pathways:

1. Flexibility enhancement
2. Core capabilities development
3. Product and/or service customization
4. Innovative potential development
5. Product and/or service quality improvement
6. Cost incurred reduction
7. Market power improvement

However, without empirical verification it is only a hypothesis that presents rather limited cognitive and practical value. Hence, it can be concluded that there is a clear need to ascertain the actual effectiveness of organizational solutions proposed in the theoretical model of the concept. Therefore, this article presents the results of empirical verification of the impact of virtualization on the competitiveness of companies. Additionally, taking under consideration, that scientific discussion about virtual organization is limited mostly to high tech industries and big corporations, the research work was conducted on the sample con-

sisted of generally small and medium sized firms belonging to high and low technology industries, as well as knowledge intensive and less knowledge intensive service industries.

## 2. PROCESS APPROACH TO ORGANIZATIONAL VIRTUALNESS

In the formulated model of virtual organization it has been assumed that opportunity of business value drives the process of design and implementation of specific organizational solutions within the virtual dimension [Katzy 1998]. Hence, decision of a firm upon exploitation of identified market opportunity is supported by strategic possibility of purposive design and utilization of varied networks of business relations – a dynamic reconfiguration of activities within the inter-organizational space (Bednarczyk 2001). The reconfiguration of activities is taking place within the space determined by a set of three parameters, namely: customer encounter, asset configuration, knowledge. In reference to the concept of Venkatraman and Henderson it is assumed that organizational transformation arises from dynamic interactions between identified parameters [Venkatraman, Henderson 1998, 33-48]. This organizational transformation is defined as the virtualization process that consist of following tasks:

- identification of core competencies of the firm
- configuration of processes around core and complementary competencies;
- definition of value added;
- redesign or dissolution of organization.

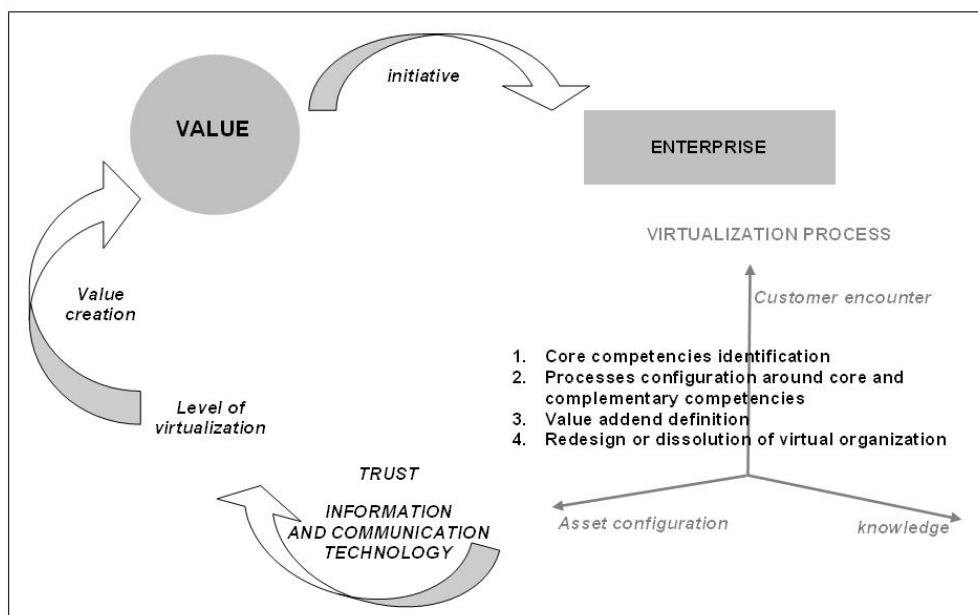


Figure no. 1 Model of virtual organization

Further, impact of two main factors – trust and information technology (IT) – stimulates more intensive and extensive reconfiguration of activities performed within the inter-organizational market space. Consequently, trust and information technology stimulate in-

tensification of virtualization process, and for that reason a given firm can achieve one of three defined levels of organizational virtualness [Venkatraman, Henderson 1998]:

1. Level of the individual task units;
2. Level of organizational processes, coordination activities;
3. Level of inter-organizational network, interdependent communities

Thus, organizational virtualness stands for a gradual feature and individual degree (level) of organizational virtualness is determined by a certain set of three parameters of the virtualization process. In other words particular level of organizational virtualness is to be recognized as a specific organizational solution developed through the process of virtualization. According to the presented framework achieving by a firm a certain level of virtualness allows for an effective exploitation of identified market opportunity, leads to higher competitiveness of that firm and at the same time leads to new business opportunities by stimulating dynamic competition [Katzy 1998]. Therefore the main hypothesis of the research has been formulated as follows:

*H 1 – The higher level of organizational virtualness the higher level of competitiveness*

### 3. KEY ELEMENTS OF THE ORGANIZATIONAL VIRTUALNESS CONCEPT

#### *3.1. Parameters of virtualization process*

As it was mentioned above it is assumed that organizational transformation arises from **dynamic interactions between three parameters: customer encounter, asset configuration** and knowledge.

##### *Customer encounter*

The increasing complexity, turbulence of socio-economic development, the rapid pace of change in the product technologies and diverse preferences of customers - imply the need for development of competencies in identifying and understanding the actual needs and desires of customers, and formulating comprehensive solutions responding to the identified market expectations [Senguder 2002, 179; Tu, Vonderembse, Ragu-Nathan, Ragu-Nathan, 2004, 150; Webster 1998; Bowen, Siehl, Schneider 1989]. Indicated strategic direction corresponds closely to the concept of meta-management, according to which the identifying and analyzing of customer requirements, and tracking the possibilities to effectively satisfy them, trigger the creation of virtual organizational configurations [Mowshowitz 1999, 8]. Thus, the customers, by declaring diverse needs and desires are acting as the initiators of the process of virtualization, that allows companies to increase their agility and versatility in action [Bahrami, 1992, 35-36], thus to provide a wide range of products and services tailored to individual needs of clients (mass customization) [Tu, Vonderembse, Ragu-Nathan, Ragu-Nathan, 2004, 152]. In the virtual organization concept client is identified as a partner, a full-fledged participant in the value creation process. The partnership means definitely broader scope and form of access to information held by each party of the relationship [Kemppainen, Vepsäläinen 2003]. The flow of information between the provider and the customer takes place in three phases - pre-transaction, transaction and post-transaction. Within each of them customer makes a subjective assessment of the company's values, reflected in the product per se, its quality, service, distribution [Quinn, Paquette 1990, 70]. Therefore, developing partnership with customers requires above all ensuring di-

rect contact, efficient and mutual communication and implementing appropriate feedback mechanisms, in order to obtain up to date reviews and to use them in the process of continuous improvement of offered solutions [Quinn, 1990 Paquette , 71].

#### *Asset configuration*

The unstable environment requires companies to be in the state of continuous readiness for change. However, transforming the structure, quantity of resources due to dynamic changes is extremely difficult and often impossible owing to the investment-related inertia [Romanowska, 2002, 165]. The necessary course of action in these circumstances is to complement the resource and competency gaps by acquiring the necessary resources and skills from other key market participants [Brandenburger, Nalebuff 1996]. N. Venkatraman and J.C. Henderson go further, claiming that enterprises should focus more on the intellectual assets, while the tangible resources should be obtained from a complex network of business partners [Venkatraman, Henderson 1998, 39]. By co-operating with selected actors firms intentionally generate a temporary network based on the core competencies of its participants. Within the created network the virtualization process is taking place [Venkatraman, Henderson 1998, 40]. The virtualization can concern the company as a whole, as well as its individual business units, processes, functions and modules. Virtualization does not mean the total dematerialization of the company. The organization which is characterized by a certain degree of virtuality always demonstrates a specific dualism, because its structure is composed by physical and virtual assets [Warner, Witzel 2004, 5-6]. The degree of virtuality reflect the evolving balance between these basic components. A set of workable organizational solutions is defined by both the different management processes (virtual and conventional) and the kind of resources at the disposal of the company (physical and virtual) [Warner, Witzel 2004, 6]. Thus, in terms of business assets, their diverse configuration determines greatly the nature and the intensity of the virtualization process. This process may in fact fall under one type of solution, or it may cover a wider range of company's functions and business processes, and thus develop using the entire set of possible configurations of available resources and management processes [Warner, Witzel 2004, 7]. Moreover, due to the development of the project or changes occurring in the environment, the balance between different categories of resources may change, which in turn may lead to a modification of the direction and scope of the virtualization process.

#### *Knowledge*

Knowledge is the final and also a fundamental component of the virtual organization concept. It represents the content pervading and integrating the entire structure and logic of the concept. According to many authors there is a globally observed shift of strategic focus from physical assets to knowledge resources, which means the recognition of the latter as a major source of competitive advantage of companies [Castells 2001; Drucker 1999, Senge 1998]. Efficient and effective process of knowledge creation provides a continuous renewal of the strategic forces of the company [Inkpen 1998, 69]. Thus the development of knowledge in the organization should be results-oriented and support achieving organizational objectives [Rokita, 2002, 213]. Since it is individuals who are a major source of knowledge in the enterprise, and the process of its creation is closely linked to their respective activities [Nonaka, Takeuchi 2000, 97], the task of the organization is to develop appropriate conditions for stimulating the creation of knowledge by individuals [Nonaka, Takeuchi 2000, 83], accumulating and utilizing the results of organizational learning pro-

cess. Ensuring effective implementation of these tasks requires taking different actions as part of comprehensive knowledge management system, which consists of five mutually interdependent groups of activities, defined as the key processes of knowledge management, namely: locating, acquiring, developing, disseminating, and preserving the use of knowledge [Probst, Raub, Romhardt 2002, 82-251]. Participation in virtual cooperation implicates additional opportunities as well as difficult challenges concerning knowledge management. On the one hand, the company is gaining access to new sources of knowledge - suppliers, customers, on the other gaining knowledge from these sources is not an easy process [Inkpen 1998, 70]. The problem of acquiring knowledge, know-how lies in the specificity of such resources. The acquirer is not able to carry out an accurate and complete assessment of them because they represent "the potential opportunities rather than the ideas that have already produced apparent results" [Probst, Raub, Romhardt 2002, 119]. Furthermore, the availability of partners' knowledge is largely limited, due to the actions taken by companies in order to protect their property rights [Das, Sen, Sengupta 1998, p. 1927-1941]. In addition, an important barrier to transmission of know-how is a low degree of formalization of knowledge embodied in it, which is often closely linked with other areas of strictly protected knowledge [Larsson, Bengtsson, Henriksson, Sparks 1998]. Therefore, knowledge management within the virtual organization has very specific features and often requires implementing new, unconventional organizational and technological solutions.

### 3.2. Levels of virtualization

Those two factors trust and information technology stimulate intensification of virtualization process, and for that reason a given firm can achieve one of three defined levels of organizational virtualness:

1. Level of the individual task units;
2. Level of organizational processes, coordination activities;
3. Level of inter-organizational network, interdependent communities

Table no. 1 Levels of organizational virtualness

Parameter	Level 1 Task units	Level 2 Organization	Level 3 Inter-organization
P1 – customer encounter	Remote experience of products and services	Dynamic customization	Customer communities
P2 – asset configuration	Sourcing modules	Process interdependence	Resource coalitions
P3 – knowledge	Work-unit expertise	Corporate asset	Professional community expertise

Source: [Venkatraman, Henderson 1998, 34]

*First level.* The virtual organization concept holds that implementation of virtual network configurations can begin once the specific needs (market opportunities) are being identified and customers become strategic partners within the cooperative network. Therefore the first stage should provide direct and permanent contact between customers and different internal spheres of the organization [Thomas 1998, 87-90]. It implicates a profound broadening of the functions performed by points of contact, a sturdy shift beyond their narrow informative or transactional specialization. Thus points of contact should provide a

permanent access to the general and expert knowledge of the organization [Rayport, Sviokla 1994, 141-150]. Implementing a customer oriented strategy signifies a noteworthy growth of complexity as well as sophistication of solutions created for the customers. Consequently it implies a need for a wide and efficient access to diverse capabilities and resources through dynamic reconfiguring of assets around specific tasks. This reconfiguration should entail tangible as well as intangible assets enabling a successful implementation of modularity-based working system. Nevertheless successful implementation of modularity requires a precise, unambiguous and complete partition of product information into visible design rules (product architecture, interfaces, testing standards) and hidden design parameters (specific solutions not affecting the visible design rules) [Baldwin, Clark 1997, 84-93].

*Second level.* The second stage of virtualization reflects an intensifying interdependence of business processes between cooperating partners. Therefore customers are expected to engage in a more intense participation in the value creation process. They should be encouraged to not only inform about their needs, but also to actively participate in design and production processes. A greater customer involvement is essential in order to provide a high level of product customization in terms of highly personalized form, context and the content of the offered product. However, it needs to be underlined that customer involvement depends on the degree of task comprehension by the customer, his/her ability to perform the task and his/her motivation to do it. Furthermore in order to provide highly customized, complex solutions the cooperative structure needs to enhance its organizational efficiency. Therefore at the second stage of the virtualization participating entities should externalize those activities, processes that not belong to the sphere of their core competences. Nevertheless, a proper definition of an optimal configuration of externalized processes should be supported by a thorough analysis of the whole value chain and a detailed evaluation of each identified process as regards its potential for the competitive edge, capabilities for its superior performance and strategic vulnerability if the process is to be outsourced [Quinn, Hilmer 1994, 43-55]. At this stage virtualization reflects a wide-ranging redistribution of complex business processes within the virtual network. It implies a considerable shift of the strategic priorities within the knowledge management “*to the extent that knowledge about a specific activity is more important than knowledge about the product itself*” [Quinn, Hilmer 1994, 51]. Consequently cooperatives should focus on an active stimulation and support of multilateral interactions between their spheres of expertise in order to prevent a potential loss of the cross-functional serendipity resulting from extensive outsourcing [Quinn, Hilmer 1994, 51].

*Third level.* At the third level of virtualness systemic transformation reaches its most advanced and sophisticated form. It introduces a new form of customer involvement, namely participation in customer communities that function as specific centers of information gathering and diffusion [Venkatraman, Henderson 1998]. At the third stage the point of attention is shifted from “the knowledge about the customer” towards “the knowledge possessed by the customer” [Rowley 2002, 500-511]. Customer community should stand for a broad platform for dynamic interchange of information and experiences between customers, where they can share their knowledge about hidden possibilities, methods of functional enhancement, or possible defects of products offered by the organization. Thus, not the buying-power but the knowledge developed within the community should determine the range of the influence of the customer community on the value creation process [Rowley 2002, 500-511]. The virtual organization concept holds that this creatively diversified knowledge potential represents one of the core spheres on a map of competences of the virtual resource

coalitions. Within the frames of resource coalitions cooperating partners such as a firm with a strong R&D division, a research center, or even an individual expert in a certain field, should be perceived as complex portfolios of capabilities and relationships [Venkatraman, Henderson 1998]. However, the status of each participant should not be perceived as stable and permanent, rather as relative and shifting due to the changes in the set of resources employed [Venkatraman, Henderson 1998]. Therefore the third stage of virtuality signifies a strategic challenge for the organization to manage effectively its position in a vibrant resource network.

#### 4. RESEARCH SAMPLE

The presented approach to the concept of virtual organization has been empirically verified on a sample of 168 firms operating in Poland. In order to avoid the risk of artificial limitations on the concept's application the research sample consisted of firms belonging to high and low technology industries, as well as knowledge intensive and less knowledge intensive service industries [EU 2004; OECD 1995]. The second criterion for selecting companies for testing was their size. Priority has been laid on micro, small and medium-sized businesses, defined under the Polish Law on Freedom of Economic Activity [*Ustawa o swobodzie...*, 2004]. The selection criteria provided ground for verification of the following two hypotheses"

H2 – firms belonging to high-tech sectors achieve higher levels of organizational virtualness

H3 – the level of organizational virtualness depends on the size of the firm

*The following tables show the structure of the research sample.*

*Table no. 2 Research sample – Knowledge-technology groups*

Knowledge-technology groups (KT groups)		Number of firms
I	High technology industries High-tech knowledge intensive services	25
II	Low technology industries Less knowledge intensive services	50
III	Knowledge intensive services	66

*Table no. 3 Research sample - Size groups*

Size groups	Number of firms
Micro enterprises	65
Small enterprises	66
Medium enterprises	23
Large enterprises	14

#### 5. RESULTS

In order to measure the organizational virtualness a three dimensional scale has been developed, where each dimension reflected particular virtualization parameter. Cronbach alpha coefficient calculated separately for each of the three dimensions of the scale was above



0,7 confirming reliability of the scale. In the research sample all three levels of virtualization has been observed. (Table no. 4)

*Table no. 4 Levels of virtualization*

Achieved level of virtualization	Number of firms
Not achieved level 1	<b>67</b>
Level 1	<b>101</b>
Level 2	<b>31</b>
Level 3	<b>6</b>

Considering the divergence of obtained results it has been examined whether the specified characteristics of the companies surveyed can be recognized as predispositions to effective implementation of virtualization process. The chi2 test results do not indicate a statistically significant correlation between the level of virtualization of companies surveyed and their membership in a particular KT group. Equally, test has not confirmed the existence of a stochastic correlation between the size of the respondents and achieved level of virtualization (Table). Consequently obtained results have not supported the hypotheses *H4 – firms belonging to high-tech sectors achieve higher levels of organizational virtualness;* and hypothesis *H 5 – the level of organizational virtualness depends on the size of the firm.*

*Table no.5 Pearson chi2 - sample selection criteria vs level of virtualization*

Variables	Chi <sup>2</sup>	p
1. KT group (I; II; III) 2. Level of virtualization	4.609524	p = 0,59
1. Size of the firm 2. Level of virtualization	7.711418	p = 0,56

Taking into account the three-dimensional character of the virtualization process, trends in evaluating the three parameters of this process have been verified. Firstly, by examining the divergence of assessments across the whole research sample, further by verifying the diversity of evaluation across KT and size groups of companies surveyed.

*Table no. 6 T-test for virtualization parameters*

parameter s	x 1	x 2	t	df	p	N 1	N 2	s 1	s 2
<b>P1 vs P2</b>	<b>3,16</b>	<b>2,89</b>	<b>4,14</b>	<b>334</b>	<b>0,000044</b>	<b>168</b>	<b>168</b>	<b>0,638</b>	<b>0,558</b>
<b>P1 vs P3</b>	<b>3,16</b>	<b>3,52</b>	<b>-4,36</b>	<b>333</b>	<b>0,000018</b>	<b>168</b>	<b>167</b>	<b>0,638</b>	<b>0,842</b>
<b>P2 vs P3</b>	<b>2,89</b>	<b>3,52</b>	<b>-8,03</b>	<b>333</b>	<b>0,000000</b>	<b>168</b>	<b>167</b>	<b>0,558</b>	<b>0,842</b>

The results of t-test confirm statistically significant differences in the assessment of defined virtualization parameters in the research sample (Table no. 6). By comparing the distributions of assessments some interesting outcomes have been obtained. The highest average ratings have been recorded in the knowledge dimension. The opposite extreme was represented by the second parameter – asset configuration, which obtained the worst result among all three parameters of virtualization. Moreover, at the first level of virtualization organizational solutions within the sphere of customer encounter were characterized by the

highest degree of successful implementation, while at the third level of virtualization their implementation was rather scarce.

Based on the observed and statistically confirmed divergence of assessments it has been examined whether this discrepancy is related to specific characteristics of companies surveyed (table no. 7).

*Table no. 7 Kruskal-Wallis test for virtualization parameters*

Grouping variable	Dependent variable	n	H (df, n)	p
Membership of KT Group I, II, III	Parameter 1	140	4,29	p = 0,12
Membership of KT Group I, II, III	Parameter 2	140	7,11	p = 0,03
Membership of KT Group I, II, III	Parameter 3	140	2,69	p = 0,26
Firm size	Parameter 1	168	3,29	p = 0,35
Firm size	Parameter 2	168	5,01	p = 0,17
Firm size	Parameter 3	167	1,02	p = 0,80

The Kruskal-Wallis test results confirm that belonging to a certain KT Group has statistically significant impact on evaluations concerning the second parameter, namely asset configuration. Based on the distributions of assessments across defined KT Groups, it was found that average ratings of this parameter in the first and the third KT Group was at a very similar level. However, among respondents representing the second KT Group asset configuration received significantly weaker score. Considering the second characteristic, the size of the companies surveyed, the Kruskal-Wallis test results have not indicated statistically significant divergence of assessments between micro, small, medium and large enterprises participating in the research.

In order to verify the main hypothesis of the research, the level of competitiveness of companies surveyed have been evaluated. Referring to the systemic approach to the competitiveness, it has been assumed that the effects of competition achieved by companies with virtualized management formula, are also the starting point of further competitive actions of these companies [Stankiewicz 2002]. Therefore, the competitive positions of companies surveyed were evaluated using a set of 13 variables. The value of Cronbach alpha coefficient calculated for the scale exceed 0,9 confirming high level of internal consistency of the measuring scale. A two-dimensional process of verification has been adopted. Static dimension, by comparison with competitors, and dynamic dimension, by analyzing changes in variables during a period of three years. The end result is a weighted average of the static and dynamic assessment classified under four levels of competitiveness of companies surveyed (Table no. 8).

*Table no. 8 Levels of competitiveness*

Level of competitiveness	Number of firms
Very high	19
High	28
Average	108
Low	13

According to obtained results the research sample reflects significant divergence concerning the achieved level of competitiveness. Therefore, it was necessary to verify whether

the selection criteria of the sample imply additional dependencies within the gathered group of firms. The results of Pearson Chi<sup>2</sup> test have not confirmed that either the size of companies (Chi<sup>2</sup>=7,697; p=0,56), or they membership in a KT Group (Chi<sup>2</sup>=1,384; p=0,97) have statistically significant impact on their level of competitiveness. Thus, the variation of the competitiveness level within the sample is not bound in a stochastic manner with the size or type of business carried out by respondents. Hence, this divergence has been triggered by different factor. In compliance to main hypothesis it is the virtualization process.

*Table no. 9 Pearson chi2 - level of virtualization vs level of competitiveness*

variables		Chi <sup>2</sup>	p
1.	Level of virtualization	31.89241	<b>p = 0,00021</b>
2.	Level of competitiveness		

Based on the results of Pearson chi<sup>2</sup> test it can be clearly stated that there is a statistically significant correlation between the level of virtualization and the level of competitiveness of companies surveyed. The main hypothesis H1 has been supported. In order to measure the relative strength of the correlation the Pearson contingency coefficient has been calculated.

*Table no. 10 Pearson contingency coefficient*

variables		C	Cmax	C*
1.	Level of virtualization	<b>0,403</b>	<b>0,866</b>	<b>0,466</b>
2.	Level of competitiveness			

The obtained value of the coefficient indicates a moderately high degree of association. In other words, the relationship between virtualization and competitiveness of the companies surveyed is statistically significant as well as fairly strong.

As it was mentioned above, the competitive positions of companies surveyed were evaluated using a set of 13 variables, that reflect the competitive potential (core competencies, image), competitive advantage (level of costs, quality of products/services) and competitive position (market share, profitability) of those enterprises. According to the theoretical assumption regarding virtual organization, implementing solutions proclaimed in this concept should enhance competitiveness through specific pathways, such as:

1. Flexibility enhancement,
2. Core capabilities development,
3. Product and/or service customization,
4. Innovative potential development,
5. Product and/or service quality improvement
6. Cost incurred reduction
7. Market power improvement

Since the positive impact of virtualization on overall competitiveness has been confirmed, it has been necessary to evaluate if this impact follows the specified pathways. The table below presents the correlation between organizational virtualness and all defined variables of competitiveness.

Table no. 11 Pearson correlation coefficient

Variable 1	Variable 2	Pearson's correlation coefficient	p
Organizational virtualness	Quality of products and/or services	<b>0,17</b>	<b>0,02</b>
	Timely delivery of products / service delivery to customers	<b>0,21</b>	<b>0,008</b>
	Number of customer complaints	<b>0,18</b>	<b>0,021</b>
	Time needed to produce products / services (the current offer)	<b>0,27</b>	<b>0,000</b>
	Time needed to produce new products / services	<b>0,19</b>	<b>0,016</b>
	Frequency of innovative offerings	<b>0,30</b>	<b>0,000</b>
	Level of total costs	0,062	0,43
	Ability to provide offering based on customers' individual expectation	<b>0,22</b>	<b>0,006</b>
	Image	<b>0,26</b>	<b>0,001</b>
	Availability for the customers	<b>0,18</b>	<b>0,018</b>
	Core competencies	0,13	0,091
	Market share	<b>0,27</b>	<b>0,001</b>
	Level of profitability	<b>0,28</b>	<b>0,000</b>

According to the results, first pathway namely flexibility enhancement can be observed. Higher level of virtualness allows for shortening the time needed to manufacture products representing the current offer of the companies. The virtualization process enhances the timeliness of product delivery to customers, availability for the customers and ability to provide offering based on customers' individual expectations as well. The last observation adds up to the next pathway – offering customization. What is more, virtualized firms much faster and more frequently introduce new products to the market. This surely reflects the improvement of the innovative potential. For the companies surveyed going virtual facilitated product and/or service improvement and definitely raised the market share and level of profitability. However, the virtualization process had no impact on the development of core capabilities as well as reduction of total costs incurred by the companies surveyed.

## 6. CONCLUSION

Virtual organization is a new formula for organizing business activity. On the theoretical ground its effective implementation is not restricted to any specific industry. Therefore any kind of business that goes this virtual path should have the opportunity to profit from the assumed impact on competitiveness. However, the empirical works presented in the literature focus mostly on large high-tech enterprises. In this research the sample consisted of SME belonging to high and low technology industries, as well as knowledge intensive and less intensive service industries. Successful implementation of virtualization process was observed in all types of industries included in the research. Moreover, the hypothesis according to which, the companies belonging to high technology sectors are achieving higher levels of virtualization than companies belonging to traditional sectors has been verified (H2). The results of empirical test have not provided satisfactory support for this hypothesis.

It should be noted, that although the obtained results do not allow for a clear conclusion of fact that the virtual organization concept is or not closely related with high-tech sectors, it significantly undermines the existing schematic view, perception of the concept. Further, the small and medium sized companies represented the main objects of the research, it has been examined whether the size of the companies may have an impact on the efficiency of virtualization process implementation (H3), the bigger the company the higher level of virtualization. The obtained outcomes have not confirmed the existence of a statistically significant correlation between the size of the business and achieved level of virtualization. Just like it was mentioned in the previous case, the results cannot be regarded as conclusive but rather in terms of an important argument in the discussion of the specific capacity and tendency of small business to virtualization. It turns out that small, and even micro companies are able to efficiently implement complex organizational solutions proclaimed in the virtual organization concept.

Based on the conducted empirical tests it can be stated that the theoretical supposition according to which there is a correlation between organizational virtualness and competitiveness of firms, has been successfully verified. Obtained results show that there is a statistically significant relationship between the level of virtualization and the level of competitiveness of the companies surveyed (H1). It was also confirmed that the identified correlation is positive and fairly strong. This means that the effective implementation of organizational solutions postulated within the concept of virtual organization is accompanied by improvement of competitiveness of companies employing these solutions.

However considering the specific pathways of this impact on competitiveness not all theoretical assumptions have been confirmed. According to obtained results the virtualization process enhanced the flexibility, product/service customization, innovative potential, product/service quality and market power of companies surveyed. Virtualized firms have not experienced total cost reduction or core capabilities improvement. Although virtualization process allows for remarkable reduction of certain categories of costs, it also implies significant increase of others. In order to implement virtual organization solutions it is necessary to make considerable investments to build infrastructure suitable for this form of activity. Going virtual means additional costs knowledge improvement, development of abilities to use new technologies, information, and costs of training in which workers learn the new philosophy of the company, a new way of perceiving its environment (Warner, Witzel 2004, 150). In virtual organization there is an increase in workload in the coordination of value creation process, since particular activities, tasks are performed separately by autonomous, often dispersed entities. Moreover, the modular production system implies additional costs of transport as produced modules have to be transported between cooperatives in order to carry out their further transformation and integration into the final product. Thus, the level of total costs incurred by the virtualized company does not have to be lower than costs of the company not participating in the virtual organization.

The lack of correlation between organizational virtualness and core competencies can be a consequence of the fact that most of the tested firms had serious problems with a proper evaluation of possessed core competencies. In their view core competencies signify most often a kind of business activity, provided offering, or knowledge of the business owner. Hence, it has been a very common practice to treat all competencies possessed by a firm equally in terms of importance. However, the reason for that is not always the lack of knowledge concerning valuation methods and procedures. In SMEs it can be observed a very emotional attitude towards a firm and all its elements – thus it can significantly distort

presented picture of a particular organization. Yet, lack of clear and distinct definition of core competencies implies numerous difficulties for effective knowledge management and further for successful virtualization process. For example, it has been noticed that surveyed SMEs often face significant obstacles while attempting to control the access to possessed valuable data and information. On one hand they do not have enough resources to provide protection for the whole possessed knowledge, on the other hand protection of only core competencies requires prior definition of those competencies. Whereas effective protection of knowledge is crucial for the efficient interorganizational learning process. According to the findings firms that possess appropriate knowledge protection solutions intensively support and stimulate communication process, exchange of knowledge and experiences between own workers representing different functional divisions and partners' workers. Considerably lower activity in this area has been indicated by firms with insufficient degree of knowledge protection. Thus lack of proper identification of core competences as well as an effective knowledge protection system significantly restrain active participation of cooperating partners in the value creation processes. Moreover, mentioned shortages can hamper the execution of other key elements of the virtualization process namely decomposing and outsourcing of business processes.

Nevertheless, it has been observed a lack of harmony in implementation of organizational solutions proposed in the virtual organization concept. It turned out that in research sample only solutions within the dimension knowledge received relatively balanced degree of implementation at each level of virtualization. Although researched companies had problems with identification of their core competences, most of them performed activities such as:

1. continuous verification of their knowledge and skills,
2. looking for specialists to carry out activities in which companies do not have the key competences,
3. continuous improvement, development of skills possessed by employees
4. collaborating with suppliers in order to improve working methods, business processes.

In the case of asset configuration there are major limits at the second level of virtualization, where it is necessary to ensure adequate coordination of interdependent but dispersed operations and manufacturing processes. During interviews, respondents indicated significant difficulties associated with conducting an effective reorganization of production processes within the network of potential suppliers. Most problems are concerned with the lack of necessary financial resources, high asset specificity, uniqueness of ongoing process preventing their decomposition, and finding suitable suppliers in the environment. As it was mentioned above lack of proper identification of core competencies, the foundation of the company that should not be outsourced but strongly protected, hampers the effective decomposing of the value creation process and further prevents strategically feasible outsourcing. The consequence of those limitations of organizational, financial, psychological nature has been a relatively low average rating in the dimension of configuration of assets. Moreover, modularization and shaping the interorganizational value creation processes is much harder for companies representing "traditional" sectors, which include production of footwear, food, furniture, retail etc.

The analysis of results relating to the dimension of customer encounter showed that the companies surveyed indicate marginal activity on the third level of virtualization. Companies demonstrate rather weak involvement in customer communities creation. What is more,

most respondents did not indicate interest in the information delivered through existing customer communities. Thus, this suggests a fairly widespread ignorance of such a method to increase customer involvement in value creation process. This assumption has been confirmed by the respondents' answers obtained during the interviews. According to empirical findings researched SMEs consider value creation as a strategic option open to a wide range of suppliers, not so much to clients, and hardly ever to competitors. Such a narrow view excludes to a large extent a possibility of setting cooperative relations with important categories of market players. Consequently, this limited perception has significantly slowed down, restrained the virtualization process of researched firms. Therefore it needs to be underlined that critical for virtualization process is not only the identification of certain aspects of organizational environment, but most importantly the interpretation of those aspects according to the conditions and strategic operations of a particular firm participating in the process.

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