Measurement of the Organizational Virtualness

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Abstract. Forceful acceleration of processes, which shape the socio-economical environment, implicates the amplification of searching efforts undertaken in order to develop and design new organizational solution as a form of strategic answer to uneasy conditions of turbulent reality. Among a broad range of differentiated concepts the idea of virtual organization is the one of significantly growing importance. However, the key aspects of the concept presented in the literature are defined and elaborated most only within the narrow scope of selected attributes of the virtual organization. In this article the virtualization logic is defined in terms of interdependent organizational processes which are stimulated by two critical factors information and communication technology and trust, and performed within the space shaped by three dimensions: customer encounter, asset configuration and knowledge leverage.

1 Introduction

Dynamic changes within the socio-economical environment stimulate firms to initiate substantial altering of their business practices, organizational structures and perception of high but manageable risk. Nowadays achieving the competitive advantage depends strongly on the awareness of and the ability to exploit the fast-changing opportunities offered by the competitive environment of the firm, while from the strategic point of view the geographical borders of that environment are becoming insignificant. The new economic reality implies directly and indirectly a need for a broad range cooperation taking place beyond formal and traditional borders between the countries, sectors and internal structures of the firm. Because of similar phases and elements of value creating process, as well as progressive modularity of production, more and more firms are deciding to cooperate in order to [8], [52]:

- ✍ gain additional growth capabilities,
- ✍ reduce and share the costs of research and development activities,
- ✍ provide access to advanced complementary technologies,

- ✍ gain current and adequate information,
- ✍ enter foreign markets,
- ✍ provide access to highly qualified and skilled staff,
- ✍ gain additional financial resources.

The networking strategy, reflected in cooperative activities undertaken on the basis of extensive and diversified relations with other market players, provides opportunity for companies to take advantage of both the economy of the scale, which is positively correlated with the quantity of resources employed, and the economy of the scope, meaning high specialization through development of core competencies in particular area of activities. The key is to be the best in selected sphere because there is no need to be the most excellent in everything. Other (than the core ones) competencies, capabilities, resources needed for the venture can be provided by a variety of market participants through cooperative networks [31][1]. Furthermore, effective exploitation of market opportunities depends on a constant improvement of internal core competences and firms' ability to gain external complementary competences and resources through cooperation with other participants of the market game [37]. Development of the networking strategy together with the emergence of the knowledge management concept stimulated rising of the new approach to management of the firm in the information era. This approach called virtual organization is focused on creating, developing and implementing knowledge assets while sourcing physical resources within a broad network of relationships [66]. In other words through the process of dynamic organizing emerges a temporary network of independent and distributed entities, linked together to exploit existing market opportunity [6]. Virtualization provides a very flexible, agile organization of business activities performed by its participants within the range of possessed core competences. Although the main idea of the concept sounds clear and comprehensive, this new approach is still developing due to pervasive research exploration and therefore the whole picture of the concept is partially distorted and contains numerous blank spots.

2 Definition of the Virtual Organization

The concept of virtual organization is recognized by many authors as a strategic answer to dynamically growing complexity and uncertainty of the environment [57]. However, the problem of organizational virtuality does not represent a precisely defined research area, because there is a lack of a coherent theoretical construction of the term. Numerous research works present a wide range of diverse perspectives, which undoubtedly enrich the knowledge on the subject but on the other hand reflect its profound fragmentariness. Those publications cover selected features of the virtual organization concept, i.e. functionality aspects [51], logistics [58], legal issues [38], [5],

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[1] According to Malecki E.J. and Tootle D.M. *network* can be defined as an organized set of linkages among cooperating firms (at least 3). These linkages can represent material or information and technology flows. "*.networks provide external sources for inputs thatn complement – or substitute for – the firm's internal capabilities*" [31:43]

human resources management [10], knowledge management [7], business process redesign [13], supply chain management [14], etc. Surely this diversity of research perspectives provides deeply specific and valuable information about crucial spheres of organizational virtuality. Yet, a proper understanding of the whole multidimensional concept of virtual organization requires developing an integrated and coherent view of its conceptual logic.

In regard to virtual organization there are two main streams of its scientific exploration, namely structure and process perspective. Hence, the structure perspective has a considerably larger number of representatives and therefore is a much more popularized approach [54][2]. Nevertheless, distinguished streams demonstrate a substantial internal heterogeneity. A broad variety of introduced definitions of the concept reflects a large scale of diversity between approaches belonging to a particular perspective – especially the structure perspective. Authors representing this approach identify the virtual organization by emphasizing different aspects of the concept, for example: J.A. Byrne – temporariness, communication relations [6]; W.H. Davidow and M.S. Malone – innovative character of organizational solutions, network relations, constant change [12]; N. Nohria and J.D. Berkeley – information and communication technology (ICT) supported communication, electronic relations [34]; S.L. Goldman, R.N. Nagel and K. Preiss – opportunism, networks of core competences [18]; M.K. Ahuja and K.M. Carley – geographical dispersion of participants, shared goals, ICT as a key measure of effective communication and coordination activities [1]. A detailed and profound analysis of proposed definitions allowed for a successful distinction of a sound set of essential attributes of the virtual organization and therefore defining it as a network of independent, dispersed entities (suppliers, customers, competitors) linked by ICT and focused on a common exploitation of possessed core competencies in order to perform joint undertaking through mutual sharing of knowledge, costs and access to the new markets. Thus the focus of the structure perspective of virtual organization is on detailed characteristics of its crucial elements, namely participants, resources and activities, and established relations, interdependencies between them (defined for the exact moment of the analysis). It supports the thesis that discussed perspective reflects a static view of the organizational virtualness compliant with the structural perception of the term "organization" [47].

The structure perspective provides a right insight into the construction of the virtual organization – a broad overview on the whole system and a close-up on its interrelated elements. It is very difficult to define the formal structure of the virtual organization because according to R.D. Hames network represents the least structured form of organization that can be observed [21]. However, literature provides some schematic models of the virtual construction [4]. The center of the organization reflects its core competencies integrated by effective meta-management (management on the network level) [32]. This strategic heart of the organization is surrounded by independent and specialized nodes supplying a wide range of top-class capabilities. Func-

[2] Polish scientific literature is also dominated by the structure perspective: i.e. publications of M. Bednarczyk, W.M. Grudzewski and I.K. Hejduk, J. Kisielnicki, K. Zimniewicz.

tioning of the virtual organization results from multilateral and multiple interactions between those nodes.

Relations between participating entities are of diverse forms. They can be developed across vertical (production – commerce) and horizontal (competition) lines of business interdependencies. Moreover agreements between cooperatives can be based on formal as well as informal procedures (formal contracts, oral agreements) [24]. However, it needs to be underlined that virtual organization as a whole does not represent a distinctive legal form of business activity such as limited liability company, foundation, association etc [4]. The lack of legal definition caused a dilemma in regard to the organizational cohesion grounds for the virtual business configurations stability. That is why the scope of research work was directed towards the sphere of specific attributes of virtual organization. Literature provides detailed analyses around four main structural dimensions: diversity, configuration, integration and technology (Table 1).

Table 1 Attributes of the Virtual Organization

Dimension	Attribute	Signification
Diversity	Modularity	The extent to which the virtual organization is based on integrated, customer-oriented processes composed of relatively small, manageable units (modules). These units are characterized by a decentralized decision-making competence and responsibilities.
	Heterogeneity	The extent to which the components of the organization have different performance profiles with regard to their strengths and competencies
Configuration	Temporal construction	Virtual configuration emerges when specific needs of customers are identified and ceases to exist or transforms once those needs are satisfied or changed.
	Loose coupling	In a loosely coupled network changes can occur within a subsystem of organizations without changing the entire network. Because of the absence of strong power and dependence relations among subsystems, the loosely coupled network is fairly stable; disturbances are handled by subsystems that are free to adapt to changing environment pressures.
	Time and spatial distribution	The extent to which the components of the organization are dispersed in place and time
Integration	High level of trust	Effective coordination of activities in virtual organization requires a high level of trust between its participants. Internal control mechanism is based on shared norms, values and self-control.
	Purpose and goal sharing	The objective that provides the incentive for creating the new organization and which serves as the cohesive force

		to hold the virtual organization components at least temporary together
Technology	Enhanced technology potential	Technology represents the enabling factor that allows the breakthrough. Participants of the virtual organization supply complementary technologies and competencies, therefore the whole virtual configuration Has a considerably larger (qualitatively and quantitatively) technological potential At its disposal.
	Key role of ICT	ICT makes the virtual form of organization possible by eliminating time and space barriers and therefore enabling the virtual configuration to function as one entity.

Source: [44], [3]

Although the structure perspective significantly enriches the scientific cognition it provides only a static view of the virtual construction, which has a very dynamic nature – it transforms constantly due to the market and environmental changes. Moreover, every new configuration represents a new virtual structure. According to D.J. Skyrme organizations that aim at achieving and maintaining a competitive advantage constantly reconfigure their business activities and consequently reshape a range and a degree of their virtuality in regard to the basic dimensions such as time, space and structure [50]. Process perspective of the virtual organization focuses on its strategic activities that trigger changes in the environment as well as determine its constant improvement and renewal [56]. The essence of the virtual organization reside in its inherent alterability, therefore it seems reasonable to recognize process perspective as a starting point for a scientific discussion and analysis of mechanisms of the virtual organization. One of the most known precursors and propagators of the process approach is A. Mowshowitz who defines the problem of organizational virtualness in terms of meta-management – management of virtually organized tasks [32]. According to A. Mowshowitz meta-management is a complex process compound of five fundamental tasks [33]:
1. determining and analyzing abstract requirements;
2. tracking the possibilities for satisfying determined abstract requirements;
3. assigning concrete satisfiers to abstract requirements;
4. maintaining or revising allocation procedures;
5. analyzing and adjusting optimization criteria.

Furthermore, it needs to be pointed out that defined process of meta-management reflects a closed cycle of recurrent activities in contrast to a straightforward sequence of certain events proposed by other authors [35], [29], [17], [49]. Within the frames of sequential concepts virtualization becomes a deterministic, foreseeable process discordant with its vibrant, dynamic nature [42]. Conceptually closer approach presents B.R. Katzy. He proposes a model of design and implementation of virtual organization based on three main constructs: the network (pre-existing industrial structures), the

virtual operation (cooperative processes), and the value (driving force of organizational renewal) linked by dynamic processes of change: network design, restructuring and dynamic competition [26]. Additionally a more broad study of the role of industrial network within the process of virtualization introduce D. Brütsch and F. Frico-Mosca [4].

Nevertheless, defining virtualization in terms of dynamic reconfiguration process is a fundamental but still preliminary step required for successful comprehension of organizational virtuality. It is necessary to continue research exploration on the subject in order to obtain answers concerning other crucial aspects, such as: definition of the outcome of the process (one optimal solution or a broad range of diverse configurations, evaluation of the outcome), or specification of critical requirements and conditions for effective functioning of the virtual organization (identification of decisive factors and the extent of their influence).

3   Diagnosis and Evaluation of Organizational Virtualness

Research work of N. Venkatraman and J.C. Henderson is one of more interesting and remarkable attempts focused on dilemmas mentioned at the end of the previous section. Primarily they "*reject a virtual organization as a distinct structure (…)[and] treat virtualness as a strategic characteristic applicable to every organization*" [56:34]. Furthermore they formulate a concept of three dimensional space of virtualization defined by three core vectors: customer encounter, asset configuration and knowledge leverage (Fig. 1). Due to the logic of the proposed virtual organization concept organizational transformation arises from dynamic interactions between identified vectors. Thus changes resulting from a narrow perspective focused only on selected dimensions do not reveal the idea and logic of the virtual concept. Since all three dimensions stand for spheres tightly interconnected within the value creation process it is necessary to perceive them as a complex but cohesive whole.

Vectors and Characteristics	Stage 1	Stage 2	Stage 3
Customer Interaction (Virtual Encounter)	Remote experience of products and services	Dynamic customization	Customer communities
Asset Configuration (Virtual Sourcing)	Sourcing modules	Process interdependence	Resource coalitions
Knowledge Leverage (Virtual Expertise)	Work-unit expertise	Corporate asset	Professional community expertise
Target Locus	Task units	Organization	Inter-organization
Performance Objectives	Improved operating efficiency (ROI)	Enhanced economic value added (EVA)	Sustained innovation and growth (MVA)

Fig. 1 Virtual Organizing: Three Vectors and Three Stages

Source: [56:34]

Each vector has three distinct stages reflecting the possible levels and range of organizational virtualness [56]:
1. Stage of the individual task units;
2. Stage of organizational processes, coordination activities;
3. Stage of interorganizational network, interdependent communities

The virtual organization concept holds that clients, and to be more precise their needs and desires [48], initiate the virtualization process [32]. Implementation of virtual network configurations begins once the specific needs (market opportunities) are being identified and customers become strategic partners within the cooperative network. Therefore the first, critical stage provides direct and permanent contact between customers and different internal spheres of the organization [53]. It implicates a profound broadening of the functions performed by points of contact, a sturdy shift beyond their narrow informative or transactional specialization. This new definition holds that points of contact provide a permanent access to the general and expert knowledge of the organization (knowledge management at the work-unit level) through the support of ICT infrastructure [40]. Furthermore implemented 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 access to diverse capabilities and resources. Therefore the first stage of virtualization is reflected in dynamic reconfiguring of assets around specific tasks. This reconfiguration entails tangible as well as intangible (local expertise) assets enabling a successful implementation of modularity-based working system[54], [56]. Modularity is recognized as a strategic option enhancing organizational flexibility by enabling a dynamic redesign of products, processes and working teams due to the market changes [36], [55]. However 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 d esign rules) [2].

The second stage of virtualization reflects an intensifying interdependence of business processes between cooperating partners. Customers are invited to engage in a more intense participation in the value creation process. They are encouraged to not only inform about their needs, but also to actively participate in design and production processes [45]. A greater customer involvement together with the modularity-based working system provide a significantly larger extent of possible product or service customization in terms of highly personalized form, context and the content of the offered product or service. However, it needs to be underlined that customer involve ment depends on the degree of task comprehension by the customer, his/her ability to perform the task and his/her motivation to do it [30]. 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 externalize a wide range of activities, processes that not belong to the sphere of their core competences. During the time of dynamically growing specialization many of the basic business processes can be executed and delivered cheaper, faster and at higher quality by external suppliers [39]. Therefore this more pervasive asset reconfiguration is based on the logic of the transaction cost economy [9]. 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 [39]. 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 pro duct itself*" [39:51]. Consequently cooperatives 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 sere ndipity resulting from extensive outsourcing [39]. Those interactions provide additional possibilities for knowledge development and its diverse application [4], [39], [56].

At the third level of virtuality 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 [20], [56]. In contrast to the first and to a large extent the second stage of virtuality that focus on "the knowledge about the customer" and the problem of its effective searching, gathering and processing, at the third stage (and partly on the second one) the point of attention is shifted towards the knowledge possessed by the customer [43]. Customer community represents a broad platform for dynamic interchange of information and experiences between customers. They can share their knowledge about hidden possibilities, methods of functional enhancement, or possible defects of products and services offered by the organization [43], [56]. Therefore, it is not the buying-power but the knowledge developed within the community that determine the range of the influence of the customer community on the value

creation process [43]. 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, that is extensive and dynamic networks of complementary capabilities, cooperating partners are perceived as complex portfolios of capabilities and relationships [56]. Hence, in resource coalitions can participate equally a firm with a strong R&D division, a research center, or even an individual expert in a certain field. However, the status of each participant is relative and changing because it differs depending on the set of resources employed [56]. Therefore the third stage of virtuality signifies a strategic challenge for the organization to manage effectively its position in a vibrant resource network.

Nevertheless, functioning of virtual configuration is determined not only by the degree of goal compatibility between its participants but also by the smoothness of the information flow among cooperatives [11]. Achieving a higher level of virtualness depends on the degree of effective ICT application, in other words ICT is assumed to be a critical support-force of the virtualization process. Virtual organization stands for a dispersed network of cooperating parties and consequently represents an exterritorial range of performed activities. Therefore, successful management of such complex set of activities requires a customized communication system linking all cooperatives and providing smooth information transfer and remote coordination of performed tasks. That is why ICT is recognized as a key component – a nervous system of virtual organization. There are three basic, interdependent dimensions of ICT application within the sphere of business processes [24]:
1. business process automation and internal integration;
2. business process redesign
3. business network redesign.

Each of these dimensions reflects different scope of ICT implementation. From local exploitation (automation of information storage, processing and exchange), through organizational structure reconfiguration up to pervasive redesign of interorganizational value chains [24]. Hence, ICT reinforces organizational changes alongside two strategic directions, namely by supporting rectification of current deficiencies in order to achieve operational excellence within the boundaries of the firm and by enhancing strategic capabilities accessible for the firm on the interorganizational level [57]. Those directions often seen as contradictory strategies should rather be treated as complementary passages leading to virtual constructions. The first one provides a sound internal ground for effective dispersion of activities and successful broadening of organizational frontiers. The latter endows stimuli for constant development and improvement of deployed working methods and procedures. Moreover ICT enable virtual organization – a broad network of diverse firms – to function and appear as one, uniform entity [59]. Clients perception grasps only its visible functions leaving the space of organizational configuration out of sight and reach.

Although N. Venkatraman and J.C. Henderson recognize only ICT as a decisive stimulus of virtualization process it needs to be underlined that there is another factor equally important for the successful development of virtual constructions, namely trust.

One of the essential features of the virtual organization is a trust-based setting of multilateral relations among its participants. Trust has a profound significance within the virtual context since it acts as a substitute of traditional mechanisms of coordination and control [22]. Because of the multidisciplinary character of trust, literature provides a broad range of diverse, often incoherent, views and definitions of the term [25], [28], [41]. In order to avoid the major, intrinsic limitations of those perspectives and at the same time exploit their valuable ideas this article presents the integrated view proposed by R. Hardin. According to R. Hardin trust is defined by a specific relation between trustor, trustee and particular context of decision making process [23]. Certain conditions implicate natural dominance of the rationality imperative while evaluating a given situation (i.e. relation between unfamiliar partners – with no previous history of joint work) whereas different context may support rather social and emotional considerations during the trust building process (i.e. trust-based relation between already or even well-known partners). This emphasis on the role of context in regard to the problem of trust is strongly supported by the social capital theory of F. Fukuyama [16].

Trust provides a fundamental basis for virtual organization, however the logic of virtualization implicates higher than traditional difficulties in successful trust-building process (i.e. temporariness, territorial dispersion, shared value chains, etc.). Therefore there is a need for a distinctive approach to the trust-building process within the virtual context. E.C. Fuehrer and N.M. Ashkanasy propose an interesting strategy compound of three parallel lines of action [15]. The first of them reflects the importance of appropriate ICT implementation for the successful communication of trustworthiness among cooperating partners. Proper application of required ICT assures a stable and mutual contact across time and space [15] and therefore stimulates development of trust in partners' goodwill as well as in partners' abilities to achieve shared goals and objectives. The second line of action is focused on the problem of legibility and mutual recognition of interests among cooperatives. Common business understanding enables successful creation of shared vision of virtual organization through a clear definition of functions and expectations within the established network [47]. Hence, mutual understanding requires a precise specification of expected outcomes (design, quality), a range of cooperative activities (task distribution, inputs) and a form of the agreement (formal, informal). It needs to be underlined that group identity as well as transparency and unambiguity of performed functions determine firms' readiness and willingness to cooperate [61]. Finally the last but definitely not the least element of presented strategy, namely ethical standards shared among involved participants. Shared norms of ethical business behavior, procedures, rules, enhance process of trust building between potential partners by providing a common ground for business understanding [3]. However, the nature of virtualization process implicates very specific challenges concerning the normative content of virtual cooperation – i.e. diversity of partners representing different ethical standards, dynamic altering of the network, unclear legal regulations in regard to virtual agreements etc. For that reason, effective cooperation requires a clear and precise communication of accepted norms of behavior and expected sanctions in case of possible violation of those norms.

4 Conclusion

Presented framework should serve theorists as well as practitioners in developing a more versatile, broad perspective on the subject of virtual organizations. Discussed concept of virtualization strategy provides an appropriate ground for a profound analysis of the virtualization problem because it encompasses a multiplicity of interrelated factors such as networked organizational structures, knowledge management, customer oriented strategy, asset management, trust, ICT, risk. The contribution of this paper is a clear indication of those categories specific in case of interorganizational relations and analysis of interdependencies between them allowing for further measurement of the level of organizational virtualness. However it is apparent that further empirical research on the mechanisms of virtual organization management is more than necessary for the benefit of the theory as well as practice. Currently, such research work is being conducted but because of the continuance of analyses results are not available yet.

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