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SELECTED CONCEPTS OF MANAGING RISK OF AN ENTERPRISE OPERATING IN A NETWORK

Summary. The aim of the paper is a general attempt to structure concepts of risk management in enterprises deriving economic benefits in form of a network rent. The aim will be achieved through analysis of the literature on the subject and observation of directions of change in modern economy. Based on the above, the selected concepts of risk management in network enterprises were defined against the response of enterprises to risk: increase of reactivity, calculation and acceptance.

Key words: cross-organizational network, risk management, network rent.

WYBRANE KONCEPCJE ZARZĄDZANIA RYZYKIEM PRZEDSIĘBIORSTWA DZIAŁAJĄCEGO W SIECI

Streszczenie. Celem artykułu jest próba ogólnego uporządkowania koncepcji zarządzania ryzykiem w przedsiębiorstwach pozyskujących korzyści ekonomiczne w formie renty sieciowej. Realizacja tego zadania opiera się na analizie literatury przedmiotu i obserwacji kierunków przeobrażeń współczesnej gospodarki. Na tej podstawie wybrane koncepcje zarządzania ryzykiem w przedsiębiorstwach usieciowionych zdefiniowano względem reakcji przedsiębiorstw na ryzyko: zwiększanie reaktywności, kalkulacji i akceptacji.

Słowa kluczowe: sieć międzyorganizacyjna, zarządzanie ryzykiem, renta sieciowa.

Introduction

The changeability and the complexity of economical surroundings are determining decision-making processes. The risk management in the contemporary economy is becoming a critical element and necessary. Organizations, in order actively to accommodate oneself to the changes in surroundings, must take the active policy of the risk management on. It's means the awareness of the most substantial risks and implementing allowing appropriate procedures on effective reduction of risks to the acceptable level. Basic areas of the risk are born of a chosen structure of the business model of the enterprise. It is indicated in the framework of conducted farther deliberations for existing of a wide range of attempts at the problem of the risk in the networked business unit. In the space of available concepts an attempt was made conceptualization of crucial concepts of structure of risk management systems.

1. Risk in an enterprise operating in a network

The ever-increasing significance of cross-organizational networks is an undeniable fact that led to the emergence of a new paradigm in the management sciences.[1] Abandonment of the attempt to control possibly the entire value chain in favor of benefits resulting from the relations occurs in anticipation of a network rent.[2] Obtaining the rent on specific capital is unavoidably connected with the incurrence of adequate risk.

The group of networks described in the literature on the subject and observed in practice is not a homogeneous one. The statement is all the more true as most of the literature, depending on the context, assigns the network attribute practically to all forms of business relations of enterprises in which coordination is, at least to some extent, based on non-hierarchical relations. Business organizations created and relations between their participants may be of capital, personal or cooperative nature. The number, frequency and diversity of enterprises' relations make it possible to see them as dynamic and extensive. A broad scope of these relations forces enterprises operating in market conditions to manage and maintain these relations and manage risk which is inherently connected with them. It seems that value management resulted in a failure in a number of companies as it neglected the significance of risk and its connection with the expected rate of return.

[1] Czakon W.: Paradygmat sieciowy w naukach o zarządzaniu. „Przegląd Organizacji", nr 11, 2011, s. 3.
[2] Studium efektywności przedsiębiorstwa w sieci. Perspektywa renty sieciowej, (red.): Kosiń P., Woźniak – Sobczak B, UE w Katowicach, Katowice 2015.

The main sources of risk in the case of business models oriented on strengthening network relations of an enterprise, taking into account assumptions of the transaction costs concept, may be as follows[3]:

- hold up risk related to the specificity of assets that may be the subject of assignment. Relations based exclusively on market contracts are connected with a lower loyalty of partners preferring opportunistic behaviors. The more specific the assets, the higher the risk of an attempt of the assets takeover. In particular it concerns non-tangible assets,
- inefficiency risk related to market competition. The stronger the competition, the biggest the possibility to obtain funding on favorable conditions without the necessity of establishing contractual obligations. Thus there is a tendency to reject connections lasting over time in favor of searching for partners temporarily offering better conditions of co-operation,
- spill over or appropriability risks related to the nature of key competences. The harder the competences are to appropriate, the lower the risk related to the development of network connections. And on the contrary, the lower the uniqueness of competences, the weaker the tendency to develop network connections,
- time risk related to the time horizon; the bigger the differences between the supplier's and the customer's planning horizons, the highest the risk of such connections and interactions. What is in fact important is not so much the time horizon taken into account in the planning systems used by potential network partners, as the expected payback period defined in the target costing.

The problem of risk faced by an enterprise operating in a network is not a new one. "It is the maxim of every prudent master of family never to attempt to make at home which it will cost him more to make than to buy[4]". This is the sense of the theory of absolute cost created by A. Smith as early as 1776. The development of economic systems made the level of benefits coming from the use of competences from outside the company increase, and the virtualization processes make it possible to reduce the risk of cooperation which in turn decreases costs of transactions made with entities from outside a corporation. Thus profits expected from the extension of the space of co-operation increase. Consequently the value of an enterprise, expressed as the current value of forecast net cash flows, increases. Key competences are a market commodity that may be acquired. It is a special commodity. It is connected with a high risk incurred by the acquiring entity since, as a rule, it is impossible to define the key competences exactly. These statements create a dilemma which is usually taken into account in decision-making models regarding the selection of a strategic development option. Synthetically the issue of horizontal relations in a network of enterprises

[3] Hallikas J.: Veli-Matti Virolainen. Risk Management in Supplier Relationships and Networks, [in]: Brindley C., Supply Chain Risk, Ashgate, Hampshire 2004, p. 48.
[4] Smith A.: Badania nad naturą i przyczynami bogactwa narodów. PWN, Warszawa 1954, r. II, s. 54.

and the use of resources in this network in financial terms may be expressed by an inequality taking into account the value of discounted forecast cash flows (*Net Present Value* - NPV)[5]:

$$NPV (A + B) > NPV (A) + NPV (B)$$

A & B being hypothetical entities co-operating in a network. The risk factor is included here in the valuation of the discount factor.

The identification of problems faced by an enterprise immersed in a network, including problem structuralization, is far from complete. Analysis of the literature on the subject, as well as a reflection on tendencies emerging in modern economy makes it possible to conclude that the response of enterprises to risk related to obtaining a network rent may be classified into three areas. The first one being activities aimed at increasing the flexibility of operation and in consequence the reactivity to changes in the environment. It is exemplified by the concept of Agile management.

Risk management is a process involving the promotion of risk awareness, its measurement and control in order to achieve the optimum relation between the level of risk and the rate of return. Although risk is associated with negative consequences of the occurrence of random events, it has two dimensions: positive and negative. Taking the right approach to risk factors requires identification of their sources which means that a model needs to be developed and the value of alternative decisions needs to be calculated. This is considered to be the essence of the second of the areas of classifying behaviors with respect to risk of operating in a network. This area is closest to typical early warning systems developed by corporations and calculation of value exposed to identifiable risk factors.

And last but not least, the third area which is perhaps not yet fully covered by structured academic reflection. Risk in this case is a normal situation and management is based on its acceptance and not on the minimization of threats arising therefrom.

2. The concept of Agile management as a response to network risk

The origins of the concept of Agile management date back to early 90s of the 20th century. Its original and so far widest application is related to project management but more and more often it acquires the dimension of "agile manufacturing" or "agile enterprise". The concept of "Agile management" is believed to have originated in 1991[6]. "Agility" of management was created as a response to the statement that changes in the environment

[5] After: Barney J.B., Clark D.N.: Resource – Based Theory. Creating and Sustaining Competitive Advantage. Oxford University Press. Oxford, New York 2007, p. 206.

[6] This is related to creating Agile Forum at Iacocca. Institute, Lehigh University and publishing the report: 21st Century Manufacturing Enterprise Strategy (cf.: Ramesh G., Devadasan S.R.: Literature review on the agile manufacturing criteria, "Journal of Manufacturing Technology Management", Vol. 18, No. 2, 2007, p. 183).

precede adaptation changes in an organization [7], and in consequence benefits of seizing opportunities are limited. An additional aspect is the fact that the concept of "agile management" is considered in opposition to Japanese enterprises which follow the methodology of "lean management". This is related to the interpretation of key objectives. In the case of Lean concept the main element is the elimination of waste. Agile management is oriented on flexibility towards customers' requirements and seizing opportunities"[8]. Enterprises pursue effective use of knowledge and competencies seen as the key resources. As a result it is possible to enter emerging markets or secure a leading position on mature markets. Agility and flexibility of production are integrated by modern information technology with innovative activities, adaptive organizational structure and activities of partners in the network. Relations with partners in the network connect entities with complementary knowledge resources and competencies. Companies operating based on the "Agile" concept have already started replacing corporations operating in a traditional way.

3. Selected models for calculating risk related to strengthening network relations

The strategy of enterprises operating in inter-organizational networks is defined as the level of aggregation going beyond a single organization based on which strategists have to find an answer to the paradox: competition vs. co-operation, and define the scope of an organization's independence and its involvement in the network of cooperative relations[9]. What becomes the key issue is the consistency of strategic goals, both individual and collective, that makes it possible to maximize benefits of the cooperation and reduce risk resulting from the functioning in a complex and uncertain environment.

For the purpose of these considerations it may be assumed that an enterprise obtains a rent from assets of incomparable nature reduced to a common denominator solely in abstract categories. These are assets of independent network entities cooperating with respect to input, assets financed with equity and debt capital of an enterprise, and relational assets associated with output which form a specific portfolio with the following formula to define the rate of return:

$$R_p = \sum_{i=1}^{3} x_i \times R_i$$

[7] Hormozi A.M.: Agile manufacturing: the next logical step. "Benchmarking", No. 8, 2, 2009, p. 132.
[8] Krishnamurthy R., Yauch Ch.A.: Agile Manufacturing a proposed corporate infrastructure. "International Journal of Operations & Production Management", Vol. 27, No. 6, 2007, p. 588.
[9] de Witt B., Meyer R.: Synteza strategii. PWE, Warszawa 2007, s. 217-248.

where:

R_p – profitability of sales in an enterprise immersed in a network,

x_i – the share of asset group (i^{th}) in the process of creating sales profitability,

R_i – profitability of asset group (i^{th}).

What is a very important statement is the indication of the nature of the rate of return on the portfolio. Regardless of the value of x, the following inequality is always satisfied:

$$\min R_i \leq R_p \leq maxR$$

It means that the turnover profitability will not be lower than the return on assets with the lowest rate of return and not higher than the rate of return on assets with the highest profitability.

Assessment of risk related to the portfolio is most often based on the phenomenon of volatility and uses variance factor or standard deviation. Thus, the variance factor for a multi-component portfolio (n-component) V_p may be expressed as:

$$V_p = \sum_{i-1}^{n} x_i^2 \times s_i^2 + \sum_{i=1}^{n-1} \sum_{j-i+1}^{n} x_i \times x_{xj} \times s_i \times s_j \times \rho\rho_{ij}$$

where, apart from the already used symbols:

s – standard deviation of the rate of return on i^{th} asset,

ρ – coefficient of correlation between rates of return on i^{th} asset and j^{th} asset.

The correlation coefficient indicates that the portfolio risk may go down or up depending on the type of relations existing between elements of the portfolio.

The question arises whether a stronger involvement of an enterprise in a network, and thus the increase of the share of assets used without formal and hierarchical dependencies, could be compared to the effect of diversification. To find an answer to this question, it is necessary to refer to the breakdown of risk based on factors creating that risk:

- specific risk of individual nature closely related to a business activity run by a specific company,
- systematic risk, contrary to specific risk, is caused by general business factors which shape the macro environment.

Systematic risk may be reduced through diversification. Both types of risk are complementary i.e.

total risk = systematic risk (not diversified) + specific risk (diversified)

This shows that total risk may to a large extent be reduced through diversification. A well-diversified portfolio may theoretically be characterized by systematic risk only. However stronger involvement in a network in the meaning based on the presented concepts, does not mean increased diversification and only changes the nature of the components of the portfolio. The portfolio itself takes into account a three-component group of assets. Network involvement is not a compulsory condition for effective operation. The risk of network relations seems to be better illustrated by the calculation model referred to below.

An instrument that enriches the interpretation of risk related to an enterprise functioning in a network that takes into account the concept of asset portfolio may be *VaR (Value at Risk*). This concept was first used by JP Morgan and presented in 1994 and is now a universal measure of risk. It means an entity's level of exposure to risk as regards holding a specific asset portfolio. It is an amount that could be lost as a result of investing in a portfolio over a given time horizon and at an assumed confidence level i.e. it informs to what level of risk a group of assets is exposed:

$$p(V \leq V_0 - VaR) = \propto$$

where:

V, V_0 – value of the portfolio at period end and current value of the portfolio,

α – tolerance level (probability close to 0).

In the case considered, the value of the portfolio may be treated as the value of an enterprise's equity. The above shows that the lower the tolerance level, the higher the Value at Risk, the longer the time horizon of the portfolio, the higher the Value at Risk. Thus, the smaller the possibility to control the resources used, the higher the estimation of VaR (subject to conditions resulting from the possibility of controlling resources), the longer the horizon of dependence on network relations, the higher the Value at Risk.

What is important for an entity remaining in a relations with other organizations is the value of the portfolio of tangible and intangible assets it may obtain as a result of exchange with network partners. The value is linked to internal resources and those to which the entity will obtain access through possession without control over them. The value obtained on account of relations is a derivative of its position in the inter-organizational network. Excessive growth of the position of one node and practical takeover of control over the network may lead to a series of negative phenomena including the loss of the network's flexibility and weaker involvement of subsidiary entities in the improvement of processes executed by the network (especially when they are forced to put their individual objectives second).

VaR calculations show that the time horizon is one month at the most. Even the most opportunistic inter-organizational networks operate in a totally different timescale and analogy should be considered with adequate proportions taken into account[10]. Reservation on the above-mentioned conditions arising from the possibility of controlling resources results from the network's level of opportunism, characteristics of entities, and most of all from the character of relations between entities in a network. On the other hand however, a possible increase of risk resulting from limiting the control over resources of network partners may

[10] To strengthen the conclusions made with respect to the time horizon, it may be pointed out that the concept of Value at Risk is applicable also in such cases as the analysis of investment projects with a particularly long payback time. After: Pera K.: Koncepcja VaR (value at risk) w pomiarze ryzyka surowcowego projektu inwestycyjnego, [w:] „Gospodarka surowcami mineralnymi", zeszyt 4/4, r. 24/2008, s. 273-289.

compensate for the diversification effect. It means that the entity's exposure to risk factors will be reduced when negative consequences of cooperation with one partner are compensated with a positive result of relations with others. This effect may be seen with respect to one type of risk or between different types thereof.

VaR is a convenient instrument for risk quantification, and in this paper it is a tool for interpreting the risk for an enterprise whose business model is based on network relations. However, one must realize the limitations regarding its application. Traditionally understood investment instruments usually entail the possibility of statistical risk analysis with respect to the criterion of volatility whereas network relations are seldom characterized by this attribute. There is a clear parallel to the term "excess kurtosis" (high values at the end of the distribution diagram). Their occurrence may limit the prediction suitability of probabilistic models for estimation of VaR. In the case of inter-organizational networks, excess kurtosis means opportunistic or irrational behavior of partners.

4. Risk as an inherent element in each decision-making situation

One may look at the same problem from a broader perspective, taking into account the increasing risk scale on one hand, and the dynamics of economic processes and quality transformation of the possibilities of IT systems, on the other[11]. Risks, faced by economic entities during the decision-making process, are now global and are characterized by de-localization (spatial, temporal and social), irreversibility and non-compensability. The direction of future development of the global economy is practically impossible to foresee. No one knows what new technologies will emerge and to what extent they will change the market subject to economic and cultural conditions.

A response is a system which may be referred to as a system of organized irresponsibility i.e. networks. The attribute of organization is facilitated by IT instruments. They create a reality of multilateral dependencies based on the exchange of information. Moreover, they make it possible to facilitate elimination of restrictions embedded in bureaucratic systems determined by repeatable procedures. What makes the functioning of this reality possible is IT technology which devalues the meaning of time and space in communication processes. Thus paradoxically they open the way to the concentration of real power in a dispersed organization. Hierarchical orders were replaced by agreed or imposed procedures carried out by systems which remain independent as long as they contribute to the achievement of

[11] This part of considerations was inspired by the term "risk society". This is a term coined by a German sociologist U. Beck which explains consequences of irreversible civilization and technological changes. After: Beck U.: Społeczeństwo ryzyka. W drodze do innej rzeczywistości. Scholar, Warszawa 2004. References may be looked for in the concept of "liquid modernity" i.e. modernity which accepts the lack of possibility to establish order (Bauman Z.: Płynna nowoczesność. Wydawnictwo Literackie, Kraków 2006.

business objectives which are in turn created by links in networks controlling key or reserved data streams in dominated networks, or agreed in polycentric or undominated networks.

Network system of organized irresponsibility creates a totally different perspective for the perception of risk. As a result of generalization and a constitutive nature of risk or rather uncertainty, risk management techniques used in enterprises are based on not necessarily adequate techniques for estimating the probability of the occurrence of negative phenomena[12]. There are study results confirming that business success or failure is more a work of chance than a result of knowledge or analyses conducted[13]. The meaning of uncertainty increases and is one of the key factors which determine the functioning of modern social systems[14].

Uncertainty in the decision-making process may be either ignored or taken into account in a descriptive or quantitative form. The decision to ignore it is connected with consequences of random actions that need not be elaborated. Descriptive form means that the area of uncertainty is identified, and the decision is made based on currently available data. Their usability and quantity is limited objectively or subjectively by the possibilities of the entity making the decision. Quantification of uncertainty involves treatment of all decision factors as random variables followed by sensitivity analysis. Intentional decision-making procedure depends in each case on information which is becoming a more and more important resource of an organization. At the same time the inevitability of uncertainty encourages to mitigate its consequences by strengthening network involvement. Clearly, the motives for network involvement are not the same for big and small corporations. The first reduce or transfer consequences of uncertainty while the latter try to reduce the uncertainty itself through cooperation with a stable partner.

Conclusion is, that it isn't possible to indicate any superiority concepts, including the problem of the risk, in the model of contemporary a company. To meet the such challenge it is necessary trainee organization and having a store of knowledge constituting the sources of the competitive advantage.

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[12] Risk management – according to ISO 31000:2009, and Polish norm PN-ISO 31000:2012 coordinated action in scope of managing and supervising an organization with respect to risk.
[13] cf..: Taleb N.N.: Fooled by randomness: the hidden role of chance in life and in the markets. Gdańskie Wydawnictwo Psychologiczne, Gdańsk 2006.
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Omówienie

Zarządzanie ryzykiem przedsiębiorstwa usieciowionego jest problemem nienowym, lecz wciąż dalekim od ostatecznej strukturalizacji. Analiza literatury oraz trendów zachodzących we współczesnej gospodarce pozwala zaproponować, by reakcje przedsiębiorstw na ryzyko związane z pozyskiwaniem renty sieciowej klasyfikować w trzech obszarach. Pierwszy z nich to działania na rzecz zwiększenia elastyczności i reaktywności na zmiany otoczenia. Egzemplifikacją tego jest koncepcja Agile. Istota drugiego z obszarów zawiera się w budowie modelu sytuacji decyzyjnej i kalkulacji wartości wariantów. Doszukiwano się analogii do modeli zarządzania portfelowego i VaR. I wreszcie obszar trzeci, jeszcze nie do końca poddający się uporządkowanej refleksji naukowej, którego inspiracją są badania socjologiczne. Ryzyko w tym przypadku jest stanem naturalnym, a zarządzanie odbywa się w warunkach jego akceptacji, nie zaś minimalizacji zagrożeń.