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DESIGN AND OPERATIONALIZATION OF TECHNOLOGICAL BUSINESS MODELS

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Abstract

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The mechanisms of the network paradigm increasingly affecting the operation of companies form a new dimension of strategic management today. This applies also to the look at the design and operationalization of business models. Business models that become a source of competitive advantage in the market should have such a configuration that will provide the company with the capability to develop and grow in value. Innovation in particular determines this capability, which is the basis for the ability to create technologically new products and services. An interesting issue, not fully examined yet, is defining the principles of the design and operationalization of such business models in which technology determines their efficiency and effectiveness. These models may be technological business models. The aim of this paper is to discuss the important areas related to the design and operationalization of technological business models in the network environment and to present conclusions that are the basis for further research in this area. The author argues that in today's, increasingly virtual reality effective and efficient tools for generating new value proposition for customers is the skillful design and use of technological business models developed by companies' participation in the network environment. It is materialized in the form of achieving superior business results by the company.

Keywords: technology, business model, network, innovation, design, operationalization

INTRODUCTION

The contemporary economy is created by new technologies in many areas. Technologies affect both the economic and social dimensions of the contemporary world. At the level of companies, they determine the development, survival or collapse of companies. Therefore, the way of using the attributes of technology to offer new outstanding value for ever increasing customers' needs is becoming particularly important. The optimal tool used for this purpose may be an effectively designed and implemented company's business model. It should be noted that the current mechanisms for building competitive advantages of enterprises focus on having an effective and efficient business model. Today, companies even compete by means of their business models and the model, in correlation with the strategy and business processes, fills in a kind of the strategic hybrid determining the shape and image of attributes of current company strategic management. The business model determines and connects its potential concentrated in and around the company into a coherent, integrated whole. It becomes a platform for developing new products and improving existing ones, it is the determinant of business sustainability. It is a kind of a business core, which supports its key attributes of success. If technology is the key attribute, the business model will be particularly stimulated by it.

In the classical approach to business models, technology is a key link in the value chain and it often determines its shape. As regards e-business models, a value chain consisting of a sequence of successive actions may differ significantly from the accepted canons and even not occur at all. Technology can thus determine the development of new business models and business models can create new technologies. Technology may also influence the creation of new opportunities that result from business models. An important element in the development and use of technology

is the environment in which it appears. It seems that nowadays this environment is a network environment and virtual space where companies operate. Thus, the success of a company is determined by its functioning on the border of the real and virtual business. The purpose of this paper is to discuss key areas related to the design and use of technological business models in the network environment and to present conclusions that are the basis for further research in this area.

The author argues that in today's, increasingly virtual reality, effective and efficient tools used for generating new value proposition for customers are the skillful design and use of technological business models developed by companies' participation in the network environment. It is materialized in the form of achieving superior business results by companies.

A Network as an Platform for Creating Technology

Nowadays, the network environment shapes the image of competition mechanisms. This is where the companies are embedded, intertwined and entangled in many relationships associated with participation in a number of formal and informal networks. Martin-Rios defines inter-firm networks as voluntary agreements of independent companies that involve knowledge exchange and sharing.[1] Hakanson and Snehota define a network as three interrelated categories: participants in the network, the resources that they have at their disposal, and the actions taken.[2] In such networks, technology has huge importance. Jarillo understands that a network is a grouping of organizations in which at least one controls the flow of tangible and intangible assets (including knowledge) between other organizations.[3] In the context of technological thinking, networks can be unqualified and qualified. As regards unqualified networks, the innovation process begins when a problem is defined by the organization, and network members start working on it. The use of the unqualified network is often crowdsourcing-based in its nature[4] and is limited to the phase of idea generation or the initial product design. Qualified networks are managed in a way that ensures confidentiality and protection of intellectual property. They may include producers, experts from various fields, engineers, and even research centers. An example of such a qualified network is a cluster. In both cases, a "from place to space" approach, where a network is a platform for spreading new ideas, knowledge and values, gains significant importance.

All innovations have no broader economic and/or social significance (for both their creators and users) until they are practically used by implementing them into production. The necessary condition for the commercialization of each innovation is the existence of an appropriate sequence of events (actions), which is defined as the innovation process.[5]

The extent to which the network environment is used in creating technology, depending on the type of innovation adopted for the creation, is determined differently. For example, closed and open types of innovation can be distinguished, as well as breakthrough and incremental types. The closed model of innovation is within the company. It means that both research on new technology or product, as well as their marketing are conducted inside the company by which they are strictly protected.[6] Therefore, the network used for the development of this type of innovation may also be closed.

On the other hand, the open model of innovation assumes that valuable ideas (concepts) of innovative solutions can be found everywhere.[7] A network appropriate for this type of innovation is an open network without borders.

Breakthrough or disruptive innovations have a different dimension in the interpretative approach to innovation. They consist in introducing new solutions, thwarting the current mode of the operation of the company, industry or sector, and often forcing their transformation. "Generally, disruptive innovations were technologically straightforward, consisting of off-the-shelf components put together in a product architecture that was often simpler than prior approaches. They offered less of what customers in established markets wanted and so could rarely be initially employed there. They offered a different package of attributes

1 MARTIN-RIOS, C. 2012. Why do firms seek to share human resource management knowledge? The importance of inter-firm networks. *Journal of Business Research:* 2.

2 HAKANSON, H., SNEHOTA, I. 2005. *Developing relationships in business networks*. London: Routledge.

3 JARILLO, J. C. 1995. *Strategic Networks. Creating the Borderless Organization*. Oxford: Butterworth-Heinemann, p. 6.

4 The process in which an organization (a company, a public institution, a non-profit organization) outsources tasks performed traditionally by employees to an unidentified, usually very large group of people in the form of open call (English: crowd+sourcing). Crowdsourcing allows all Internet users to participate in tasks that were once reserved for a small group of specialists.

5 SZCZEPAŃSKA-WOSZCZYNA, K. 2014. Innovation processes in the social space of the organization. *Regional Formation and Development Studies" Journal of Social Sciences*, 3(14): 220–229.

6 CHESBROUGH, H. 2003. *Open innovation. The New imperative for creating and profiting from technology*. Boston: Harvard Business School Press, p. 31.

7 CHESBROUGH, H. 2003. *Open innovation. The New imperative for creating and profiting from technology.* Boston: Harvard Business School Press, p. 44.

valued only in emerging markets remote from, and unimportant to, the mainstream.[8] Breakthrough innovations are most often the result of adopting the strategy of driving innovation through technology. A network, where innovations are created, is then dynamic in its nature, and permanent changes in network interconnections take place. Incremental innovations, also known as continuous, mean improving the existing solutions. Incremental innovations usually result from systematically taking the market signals into account. Thus, the network will be usually evolutionary in this case. Therefore, the network enables the implementation of joint initiatives of companies embedded in the network aimed to create new technologies. The exchange of value in the network between companies can create completely new products or services. The exchange of value results from the migration of values. Migration processes cause the inflow and outflow of values.

The inflow of values results in:

- improving the competitive position of a company embedded in the network,
- reviving the company's strategic resources, including the business model components,
- increasing the social and intellectual capital through the network,
- increasing innovation based on obtaining knowledge and technology from the network actors.

The outflow of values, on the other hand, has the opposite effect, i.e.:

- the loss of competitive position of a company embedded in the network,
- lack of cash for reviving strategic resources,
- the loss of power inherent in the social and intellectual capital of the company,
- the loss of opportunity for development through innovation diffusion.

For example, one of the key factors for developing joint innovative undertakings in the network is the co-creation of value by using similar or the same technology. Especially in the field of e-business models, a dominant role is played by communication platforms and the choice of the environment where a business model is implemented. The dynamic development of digital data processing technology contributes to transferring the business to the Internet. Some or even all of the operational processes are carried out using the tool. It significantly changes the current approach to business models based on the classic value chain.

The network opens the way for interactive space. This space is often disordered, it also includes many new values or new configurations of values that may materialize in the form of new products, services or components of business models of companies embedded in the network.

Business Modelsin the Network Environment and Technology Approach – Analysis of the Literature

Networks are identified as a key element of business models.[9] The actors' business models must be sufficiently compatible to engage in common market practices.[10] According to Henry Chesbrough, a better business model often will beat a better idea or technology.[11] If there are innovators who lose there must be followers/imitators who win.[12] According to Charles Baden-Fuller and Stefan Haefliger, technology from other sectors such as information technology influences the way in which a business model can be created and adapted.[13]

The shape, effectiveness and efficiency of the business model is affected by the technology used. Based on the literature review, Afuah and Tucci highlighted several new kinds of technology, stimulating the emergence of business models. In long-linked technology, existing interdependencies are sequential and different tasks are performed serially. This type of technology may include the continuous processes of processing in the chemical industry and production lines in the automotive industry. Intensive technology is, however, focused on solving very narrowly defined problems. Techniques for solving a problem are chosen in an iterative manner by taking next steps to achieve the goal. It is a kind of value shop. A model of value shop is characteristic of most service activities. Mediating technology plays the role of a link between two or more customers who want to enter into a certain relationship, e.g. as borrowers and lenders, sellers and buyers. Mediating technologies allow the provision of services called "mediation services".

8 CHRISTENSEN, C. M. 1997. *The Innovator's Dilemma*: *When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business School Press.

9 SHAFER, S., SMITH, H. & LINDER, J. 2005. The power of business models. *Business Horizons,* 48: 199–207.

10 NENONEN, S., STORBACKA, K. 2010. Business model design: Conceptualizing networked value co-creation. *International Journal of Quality and Service Sciences* 2: 43–59.

11 CHESBROUGH, H. 2007. Business model innovation: it's not just about technology anymore. *Strategy & Leadership*, 35(6): 12–17, p. 12. DOI 10.1108/10878570710833714.

12 TEECE, D. J. 1986. Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy,* 15: 285–305, p. 286.

13 BADEN-FULLER, C., HAEFLIGER, S. 2013. Business Models and Technological Innovation. *Long Range Planning,* 46: 419–426, p. 424.

The related configuration of values is called "a value network".[14]

David J. Teece states that the dynamic capabilities framework also recognizes the challenges associated with inventing business models, and the importance of making investments behind new technologies. In the dynamic capabilities framework, sustainable advantage comes from honing internal processes, structures, and procedures to generate and successfully commercialize innovations, be they technological or organizational.[15] It should be noted that the network character of economic relationships requires a factor stimulating their sustainability. In the classical approach to building alliances and other forms of building a relatively stable relationship between the entities, it is necessary to understand the needs of partners, but in particular, the chances to create value for the two or more entities. Technology is a factor stimulating the creation of business models, it is also a prerequisite for the sustainability of this model and it determines its potential and opportunities on the way to achieving operational excellence and the ability to capture more value from the market than their competitors. In this perspective, it is worth mentioning a few definitions of business models that focus its configuration on providing values and on ways of delivering value to customers. Lisein, Pichault, Desmecht assume that a business model presents a simplified conceptualization of the way of "doing business". It also explains the choices made within the frames of the applied competition strategy. A business model can be presented on three axes: a) the identification of the customers and the choice of their particular type; b) the identification of the company products and the recognition of the customers' demand; c) the identification of the methods in which the products are offered and delivered better than these used by the competitors.[16] Rappa assumed that a business model describes a method of doing business. He lists the following points: what a company does to create values, what its place is in the value chain and describes the relationships with its customers that are required to generate income.[17] Shafer, Smith, Linder defined a business model as a representation of the company core logic and its strategic choices to create and capture values in the value network.[18]

Therefore, a factor shaping the business model is its component character. Fig. 1 shows the three phases of the analysis of the component business model.

The phases comprising insight, architecture and investment affect the extent to which the potential of the business model is used and pave the way for its operationalization. This is closely related to the solution presented in Fig. 2.

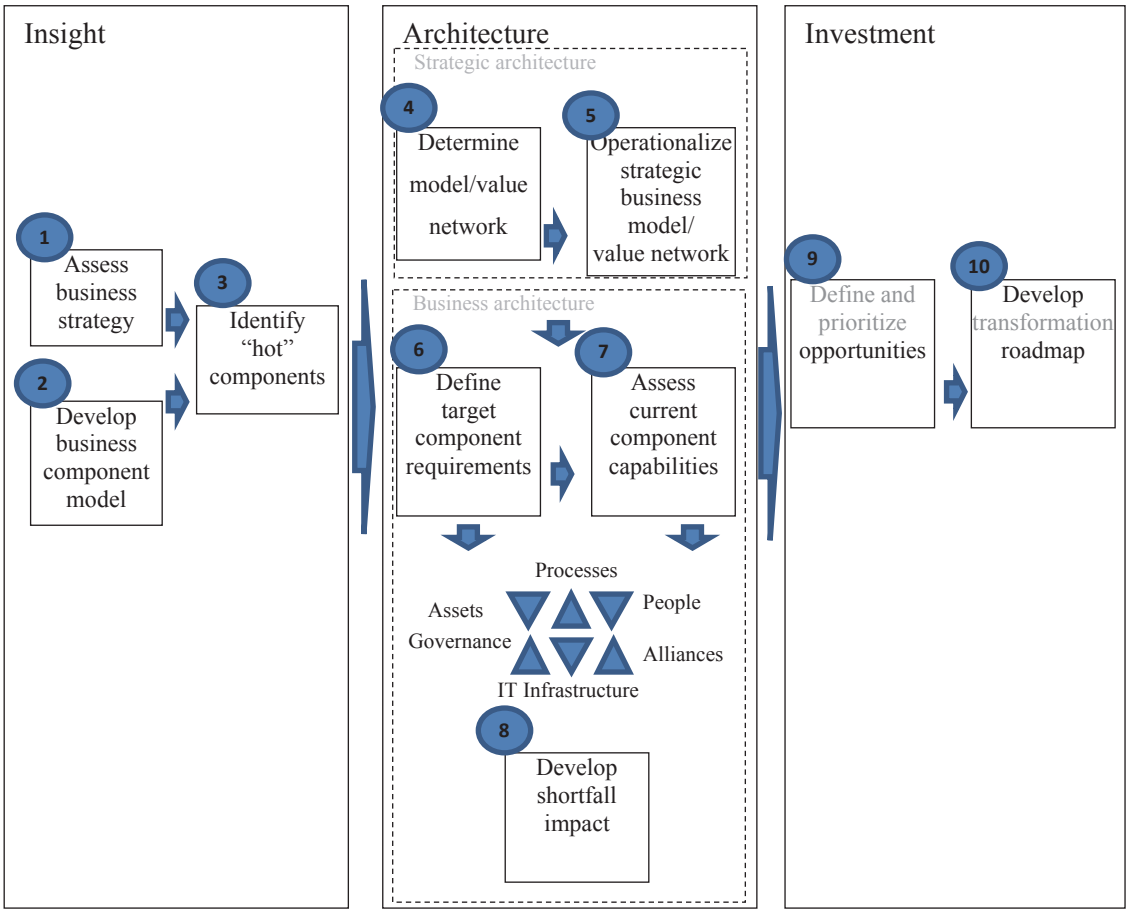
Presented subjectively, however, it may include the relationships in the Market – Products – Technology system. Fig. 2 below presents a classic model of technology transfer, including the defined relationship in the roadmap system.

The above model of technology transfer including markets, products and technologies in the form of a roadmap can be a platform for building technological business models. Each of the three elements can be a source for new components of the business model of the company embedded in the network. In addition, it can be assumed that for the network environment, the most common innovation, including technological one will be open innovation, which can occur anywhere in the network. The overlapping relationships determine the way for new relationships, which results in new business.

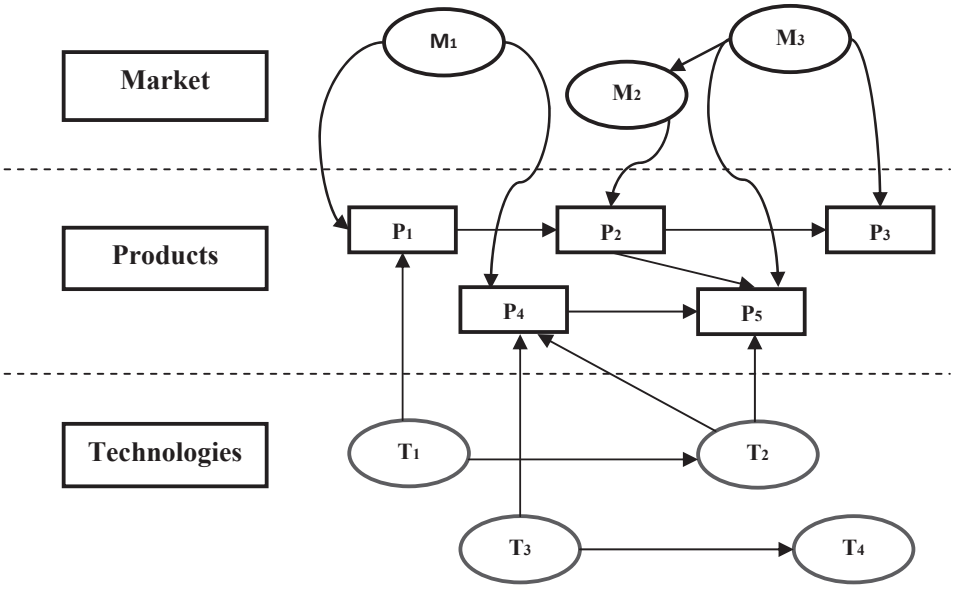
This approach implemented in a network environment can use the network with the cluster structure, where the special role is played by universities, research institutes and companies. The cluster network can be structuralized then, for example, through:

a) The model of the triple helix[19] – the triple helix is an innovation model which includes mutual complex relationships that occur in the process of knowledge creation between the three types of actors: research centers (universities, scientific research centers, supporting institutions), industry (companies) and the government (with the exception of local government institutions). The potential of cooperation is determined by the relationship between the three entities, and the lack of such relationships significantly impedes the flow of knowledge.
b) The Industrial Cluster diagram by Michael Porter[20] – In his concept, a spatially concentrated group of companies from one industry clustered around a research unit, not competing with each other, but co-operating in those areas where it is possible, operates and synergy is created.

14 AFUAH, A., TUCCI, C. L. 2003. *Biznes internetowy strategie i modele*. Kraków: Oficyna ekonomiczna, 154–155.
15 TEECE, D. J. 2006. Reflections on: Profiting from Innovation. *Research Policy,* 35: 1131–1146, p. 1144.
16 LISEIN, O., PICHAULT, F. & DESMECHT, J. 2009. Les business models des societes de service actives dans le secteur Open Source. *Systemes d'Information et Management*, 14(2).
17 RAPPA, M. A. 2004. The utility business model and the future of computing service. *IBM Systems Journal*, 43.
18 SHAFER, S. M., SMITH, H. J., LINDER, J. C. 2005. The power of business models. *Business Horizons*, 48: 199–207.
19 LEYDESDORFF, L., ETZKOWITZ, H. 2001. The Transformation Of University-industry-government Relations. *Electronic Journal of Sociology*. Available at: http://www.sociology.org/archive.html.
20 PORTER, M. E. 1990. *The Competitive Advantage of Nations.* Hampshire and London: Macmillan Press.



1: *The three phases of CBM analysis: Insight, architecture, investment*
Source: Component Business models. 2005. Making specialization real, IBM Institute for Business Value, IBM Corporation: 10.



2: *A model of technology transfer using a roadmap*
Source: RINNE, M. 2004. Technology roadmaps: Infrastructure for innovation. *Technological Forecasting & Social Change*, 71: 69.

c) A funnel model[21] – it describes the concept of the company and its environment in a funnel system, from the global economy through the general business environment and microeconomic business environment to the cluster and companies.

Look at the enterprise management in the network environment allows for the adoption of the following findings:

1) The business model does not exist without the network environment.
2) The business model should have a certain dynamics.
3) The dynamics of the business model should be linked to the dynamics of the network.
4) The effectiveness of the business model should be achieved through the use of network effects.[22]

The Design and Operationalization of Technological Business Models in the Network Environment

The design and operationalization of business models are two key actions used to obtain the assumed rates of return from this important ontological entity. The design of business models is highlighted by Christoph Zott and Raphael Amit. They discuss two areas as regards business models: design elements and design themes. Design elements include content, structure and governance and design themes include novelty, lock-in, complementarities, and efficiency.[23] The process of designing a business model does not need to be forced, but may be gradual. It should be noted that for the successful design of business models, it is necessary not only to adopt the proper mindset and its attributes, but also use it skillfully. Network activity enhances the chances of adjusting the business model to the possibility of developing the company's ability to capture value from the network. The operationalization of business models will be related to the methods of their implementation in practice of contemporary business, mainly in searching for the profitability of the business model and the ability to increase efficiency. Then all strategic and operational activities aim to achieve the results, determining the implementation of objectives set by the company.

A condition favourable to the development of business models is to increase the role of business models in which technology is crucial, so called technological models, e.g. business models depending strongly on the technological capabilities of the components making up the configuration. The configuration of the business model is then characterized by the attributes of the technological dimension. Then the components of the business model ensure its functionality in the continued development of new products and services.

In order to connect the issues of design and operationalization of technological business model, it is essential to develop a process outline of designing the desired configuration of the technological business model using the components obtained from the network.

An important issue shown in Fig. 3 is the transition from an idea to the operationalization of the business model by searching for business model components from the network, configuring the business model to achieving the state of desired configuration and analyzing the functionality of the business model. These activities are aimed at obtaining and configuring business model components, where the key criteria for their selection are technological criteria.

The technological business model of the company is defined by the author as a business model whose key, distinguishing components are the components that are innovative technology, its part and / or its configuration, generating a higher value than other possible to apply in the configuration. The configuration of the technological business model provides unique value to customers in the form of a product and / or service offered through modern mechanisms for offering this value. This business model is capable of increasing revenue geometrically. The most common environment of technological business models is a network environment and virtual space.

The various stages of the design and operationalization of the company's technological business model embedded in the network are shown in Tab. I.

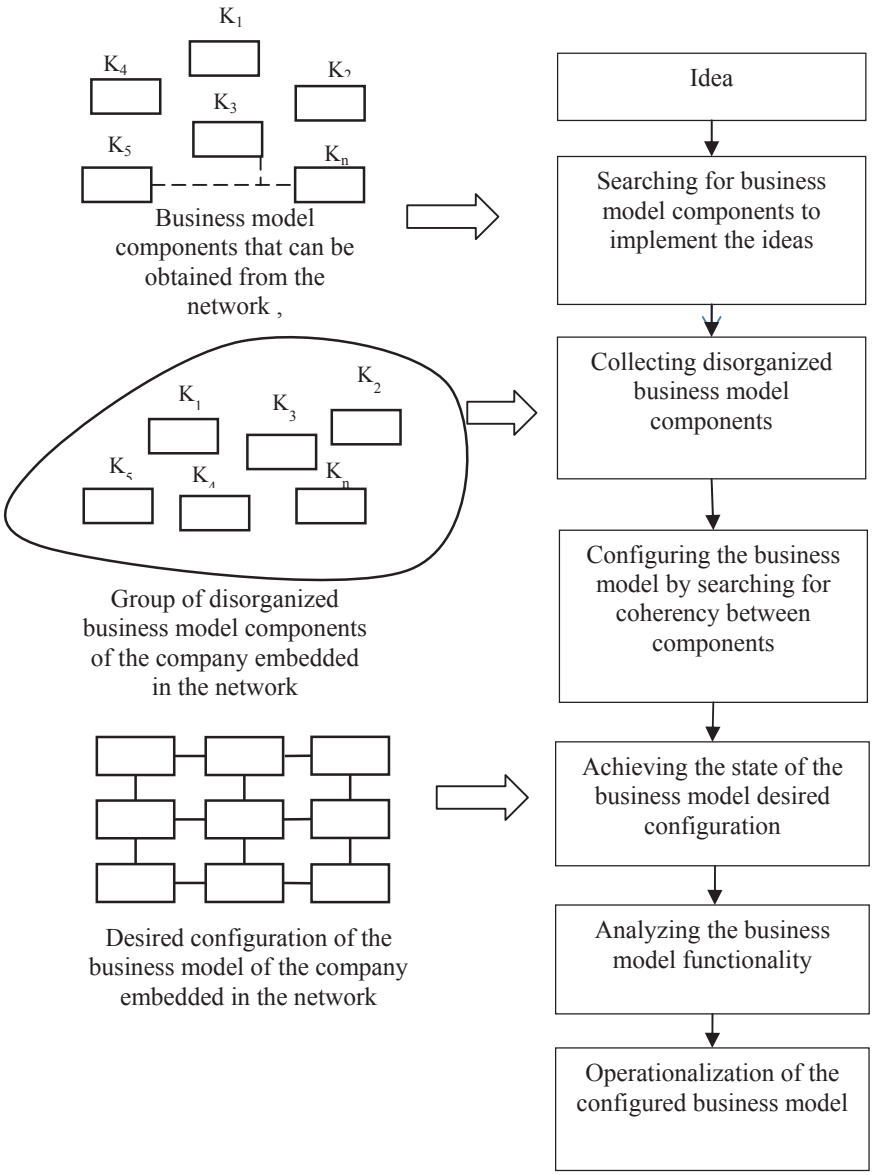
While analyzing in detail the stages of the design and operationalization of the technological business model, the logic indicating the presence of milestones approximating the company to achieving the assumed efficiency should be highlighted.

As regards the design, it is of particular importance to define the core attributes of the company's technological business model, with particular emphasis on attributes resulting from technology. As far as business model operationalization is concerned, its scalability is a key associated with its ability to adjust its resources and components by increasing or decreasing them in relation to market possibilities and needs.

21 SÖLVELL, Ö., LINDQVIST, G. & KETELS, C. 2003. *The Cluster Initiative Greenbook*. Stockholm: Ivory Tower. Available at: http//: www.cluster-research.org.

22 JABŁOŃSKI, A. 2015. Network dynamics and business model dynamics in improving a company's performance. *International Journal of Economics*, III(1): 10.

23 ZOTT, C., AMIT, R. 2009. Business Model Design: An Activity System Perspective. *Long Range Planning*. DOI 10.1016/j.lrp.2009.07.004.



3: *Process outline of designing the desired configuration of the business model using the components obtained from the network*
Source: Own study

I: *The stages of the design and operationalization of the company's technological business model embedded in the network*

No.	The stages of the design and operationalization of the company's technological business model embedded in the network
1	Defining key markets in which the company intends to operate
2	Defining key products offered in key markets
3	Defining key technologies necessary to be implement by the company
4	Defining the attributes of the network environment in which the company intends to operate
5	Defining the basic attributes of the company's technological business model, with particular emphasis on attributes resulting from technology
6	Treating technology attributes as key success factors of the technological business model
7	Linking the technology attributes of the business model with a selected type of innovation (e.g. open, closed, breakthrough, incremental)
8	Linking the company's technological business model with the company's technology strategy and technology-oriented business processes
9	Scaling the technological business model
10	Implementing the technological business model through the implementation of the technology strategy and technology-oriented business processes
11	Evaluating the effectiveness and efficiency of the implementation of the technological business model regularly.

Source: Own study

CONCLUSION

The network environment shapes the present dimension of modern business. Technologies determine the shape and image of the modern world economy. Technological business models can be an element connecting these two key areas of the business new dimension. They determine the creation of innovation, bring dynamics to the development of the company, and determine the strength of the relationship with the market on which innovative products are offered. Shaping technological business models in a network environment may be the factor determining the emergence of new perspectives in strategic management of companies operating in the market.

The combination of using of network effects and technology for the development of the business model allows the generation of accelerator of specific values. Is created a dynamics, which results are a new products that fulfill the sophisticated needs of the customers. The connection between use of network dynamics and the dynamics of technological business model increases the chances of the enterprises embedded in the network to achieve high performance by them. This is confirmed by scientific research and observations the author in a lot of case study. Particular importance have a designing of technology business models using the of network.

To sum up, the following conclusions can be defined:

1. Technology may be a key attribute of business model design and operationalization.
2. Due to technology new business model components may be obtained from the network.
3. Technology may determine the company's ability to revive the business model strategically.
4. Technology may develop new sources of innovation, being an accelerator of growth of company efficiency in the network.
5. Technological business models may be a source of faster development and growth of company value.
6. Technological business models may, in a consistent manner, allow the existence of the company in a network environment.

These findings open the way to new, further research towards enhancing the efficiency of enterprises operating in the network. These researches may include:

1. The role of the network environment to design and operationalization of technology business models.
2. The role of the technology business models in improving business efficiency.
3. The impact of network effects on the efficiency of technology business models.

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