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PRODUCT DEVELOPMENT – AGILE APPROACHES FOR THE ENTERPRISE [35]

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Abstract: *The conditions of the current financial and economic environment, prove the need for additional research and promoting new ways of organizing the product development process of enterprises. The turbulent external environment, the global competition, fragile demand and the increasing often unpredictable requirements of potential customers place a big challenge to the enterprises worldwide. The agility of enterprises offers a way to survival, development and growth potential in this highly turbulent business reality. It helps the business to predict the new global economic trends and makes use of crucial moments as new opportunities for development. The agility of the enterprise uses internal and external change in the environment to increase its competitiveness and thus ensures stable and profitable existence of the enterprise. The agile methods of product development help the enterprise generate rapid and continuous innovation in order to manage the changing priorities in the pursuit of meeting the customer's expectations.*

Keywords: *Agile, Agility, Product Development, Agile Manufacturing*
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INTRODUCTION

The increase in information flow, the possibilities for imports and exports, the relatively low prices for transport make the import and export of goods relatively easy. The new business realities give enterprises the chance to enter new markets practically all over the world. The European Union, for example, allows the states in itself to exchange goods with each other duty-free. The open market, though, contributes largely to the emergence of new and unexpected competitors. This is a serious challenge to the manufacturers in these states, but at the same time, a unique chance to improve the competitiveness of European enterprises. The necessity for new product development approaches is imminent. The enterprises need to use different techniques for the successful development, production and distribution of products in order to ensure sustainability of operation and enhance chances to gain new markets. These global processes are well observed by a number of scientists. Research is done in both analysing the existing means of product development as well as in proposing new ways of overcoming the challenges of the contemporary business environment.

This work will focus on the state of agility of the enterprise as a means of providing product development possibilities. Then the work goes farther exploring different aspects of agile product development not necessarily connected to the agile enterprise.

EXPOSITION

1. Emergence and Evolution of the Concept of the Agile Enterprise

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The change in the business environment and uncertainty have entered long ago the studies and research of management. In 1967, James Thomson examines the current challenges facing the enterprise (Thompson, 1967). He analyses the "cutting edge" of uncertainty that affects both the management and the operational part of the enterprise. Furthermore, the author believes that no enterprise is fully independent of the surrounding environment. Rather, it is "part of a broader social system that is the source of meaning, legitimacy and support that enables the company to accomplish its objectives."

A number of other authors, such as Selsky (Selsky, 1984), A. Small and A. Downey (Small A.W., 1996) explore the uncertainty and "hyper turbulence" of the environment in which they are placed. Peter Drucker (Drucker, 1968) in 1968 and in 1995 (Drucker, 1995) describes the concept of "entrepreneurial task" as a search for change, the reaction to this change and its use as a new opportunity.

In the 80 years of the 20th century, there was a decline in US production and its competitiveness. The US Congress in 1990 decided to take measures to overcome the problem and instructed the Ministry of Defence to investigate the possibility of increasing the competitiveness of American businesses. Ministry of Defence, in turn, assigned to the University Lehigh to prepare a strategy for sustainable development, as well as methods for its successful implementation. In 1991, Iacocca Institute publishes a report in two volumes with conclusions, recommendations and methods of implementation of the planned measures by the US Congress. This scientific work is entitled "Production Strategy for the 21st Century" (Institute, 1991) and is the result of 7,500 hours of academic work. The first appearance of the term "agility" is precisely in this publication. Its main idea is: "Do you want to catch the moment or stay on the reserve bench?!" It explores the state of the US economy, considering that mass production offers no longer a profitable strategy. It describes the state of the European economies, the growing role of Japan and the Asian Tigers (Hong Kong, Singapore, South Korea and Taiwan). It develops the concept of a 15-year strategy to restore American leadership in the world economy, recognizing that this is only possible if agile manufacturing is implemented. According to the report, the concept of "agile manufacturing" is a combination of flexible technologies, innovative management skills and a well-trained workforce. Emphasis is placed on the enormous role of the human factor. The report thoroughly and professionally examines challenges to US economy at that time. The analysis provides advice to both the US Congress and the Ministry of Defence. The basics of the concept of "agility" have been given. Even more important is that it gave publicity of the new market realities. The report is a turning point for many scientists in the coming years. With its complete and thorough analysis of the facts in the US economy, it provides a solid scientific basis for a number of articles and publications around the world.

In 2001, the British scientist prof. H. Sharifi (Sharifi, 2001) create and publish the first comprehensive analysis about the agile manufacturing. It is based on a detailed study of the business environment in which companies operate. New market trends, growing competition and the increasing speed of change create opportunities for bankruptcy of many enterprises (according to the two researchers). However, others are able to benefit from changes in the environment. For this reason, the model explores the agility of enterprises to the changes in the business environment. The purpose is to increase the competitiveness of the companies in an increasingly dynamic and turbulent national market.

A number of authors after 2001 continue the analysis on the topic (Kosuliev, 2015) (Trifonov, 2003) (Marichova, 2015). They update the parameters of the tested indicators. For example, the introduction of e-commerce leads to reduction of final consumer price by eliminating the intermediary role of retailers and, in some cases, even the big traders. Moreover, this kind of trade enables the development of trade links over long distances in geographically remote and also in sparsely populated and difficult to access areas that until recently were not available for the classical distribution network. There are new methods for building and strengthening the trust between the seller and the customer. The apparent convenience, lower terminal prices and the increasing number of Internet users are a prerequisite for continuing the development of this sector. Businesses could also benefit from e-commerce to expand their markets and attract more customers

for manufactured goods. Increasing sales volume (ceteris paribus) means that agility (as one of its aspects) of the enterprises is associated with it. E-commerce allows direct contact between producer and consumer. Feedback from the customer to the manufacturer is direct and fast. Therefore, products can more quickly adapt to the dynamically changing needs of the customer. Furthermore, knowledge of the customer is the basis for conducting targeted marketing.

The importance of marketing to improving the agility of enterprises is huge. J. Poolton, S. Hossam, Ismail, I. R. Reid and I.C. Arokiam (Poolton, 2006) in 2006 precisely analyse the impact of marketing decisions on the increasing agility of small and medium enterprises. The survey, which was used, included cases to investigate the so-called "agile marketing". Typical marketing strategies used by large enterprises were implemented. The authors concluded: "... the creation of agile strategic framework allows companies to correct their operational and marketing weaknesses and thus cause strategic (in top-down perspective) and operational (bottom) growth. The scientists discover hidden potential in the analysed companies. The two authors create a marketing plan to attract new customers, which in this case materialized and resulted in four new clients. The conclusion is, however, that the application of the principles of agile manufacturing in marketing show that there are many constraints that prevent the SMEs from profiting. The obstacles are mainly associated with a small marketing budget of the SMEs compared to those of the large enterprises. However, "the greater the flexibility and ability to adjust production and marketing strategies, the larger growth can be achieved. The spare capacity could be used to attract new customers" (Poolton, 2006). Another approach to enhance the agility of the enterprise is given by the internal branding (Kenarova-Pencheva, I. & Antonova, D., 2018) (Kenarova-Pencheva, I., Penchev, P., 2017) (Kenarova-Pencheva, I., Penchev, P., 2017).

Agility of the enterprise is a state in which it responds quickly and appropriately to the turmoil of the external increasingly turbulent business environment, predicts the new global business trends and uses critical moments as new opportunities for development. It is able to overcome freely the abrupt internal problems. The agility of the enterprise uses internal and external change in the environment to increase its competitiveness and thus ensures stable and profitable existence of the enterprise (Penchev, 2015). Such an enterprise uses agile methods for product development trying to ensure sustainability of its production process and distribution of goods and services.

2. Agile approaches to product development

2.1. Innovation Ecosystems for Industrial Sustainability

Enterprises in countries with relatively high wages try to shorten the product development process and the innovation cycles at lowered costs in order to strengthen their competitive position and to support resource sustainability. Thus, companies try to promote innovations through various collaborations. Such collaborations differ in terms of time and costs and are therefore often used by large companies with significant financial resources. One opportunity for smaller companies to develop sustainable products is the creation of projects of product development within innovation ecosystems. In order to sustainably innovate in such ecosystems, their efficient as well as effective design becomes inevitable. (Riesner, 2018)

The business ecosystem describes a network of organizations and individuals, who coordinate their roles as well as capabilities and align their investments in order to create value and/or increase efficiency (Moore, 1996).

The questions facing the enterprises are:

- How to increase the output in an ecosystem?
- How to reduce the input in an ecosystem?

When the innovation ecosystems consist of diverse partners, an agile approach supports communication and customer integration. Agile Product development is an approach which prefers flexibility and improvement during a smaller process to linearly rigid planning and processing. Takeuchi and Nonaka first described such practices in successful companies in Japan and North America. They called it “rugby approach”, as they identified parallels to the sport with its interruptions in the game and the reorientation of the teams (Takeuchi H., 1986). The agile

processes focus on customer value. The most famous agile method is Scrum (Gerber, 2019)**.** It is an agile method, developed by Schwaber and Sutherland. This method separates the project into sprints. The team is divided into roles and creates product increments in each sprint (Schwaber, 2019)**.** The team is assigned three roles: the owner of the product takes care of the work result and its representation. There is a scrum master who is responsible of the team. He moderates the meetings, and supports the team work. The team working on the product development is responsible for the design of the product. Each sprint is organized into phases. The daily scrums consist of short, daily meetings. When the sprint ends, the achieved product increment is evaluated by the customer. In the end, the team evaluates the results and makes improvements before the start of a new sprint with the feedback from the team and the customer (Schwaber, 2019)**.**

2.2.The Developers Dilemma

A start-up enterprise, which strives for profitability needs to accelerate two main processes – developing of new products and finding new markets or niches for their goods and services. These two aims are typically opposing each other. Business development requires quick replication of the production process and product development requiring focus on quality. Then the efforts should be on the balance between ease of production and quality of the product. This causes a conflicting environment for the developers to develop products on one side and the wish of the managers to ensure an easy and smooth production process. This problem is worsened at a start-up enterprise, where the product or products are new and a possible failure cannot be easily traced back to its causes. Clear ways to communicate the product goals and even successes between management and developers is needed to create an environment for success. This balancing act between quality and speed to achieve fast product replication is the developer's dilemma (Terho, 2016).

2.3.Agility Factors of Product Development

Agile product development is popular but still not well understood beyond its methodological implications. The identification of agility factors enables teams to make and communicate decisions more quickly in product development. On this basis, a quantitative System Dynamics (SD) model is developed and analysed to explore the impact of the identified agility factors on the product development performance. The results show that both methodological and team factors do not only influence agility but can also significantly improve the project completion time and product quality (Rebentisch, 2018).

The "agility" construct is defined as an ability of the project team to quickly change the project plan. At the same time there is lack of comprehension of how agile methods can lead to more agility and how this might improve the overall project performance (Conforto, 2016).

The agility of a product development team describes how well it is dealing with uncertainties in terms of potential product changes (Hull, E., Jackson, K., Dick, J., 2017). From the point of view of the product developments, uncertainties can be either inconsistent knowledge or insufficient definition (McManus, H., Hastings, D., 2006). If there is inconsistent knowledge, the product developers are not aware of information that is needed to complete the project in a rational way. If the definition is not precise, the information needed for the product development is incomplete in order to accomplish the project. The two types of uncertainty can be defined as unknown unknowns and known unknowns (Asan, 2013). Unknown unknowns are accordingly treated as project tasks that cannot be anticipated by the product developers. The known unknowns are tasks the developers realize and can take into account during the execution of the product development (Ramasesh, 2014). The agile product development goes far beyond a mere application of certain methods. It is a process of decomposition of the unknown unknowns and using of the known unknowns so the entire project is successfully finalized.

2.4. Waterfall vs. agile product development

Manufacturing enterprises applied the phase-gate approach, where the product development moves from one phase to the other by fulfilling quality criteria and passing the respective quality gate (Cooper, 2008). The Software resorted to the Waterfall model (Royce, 1970). The common feature that these methods share is that they are concentrated on the planning phase of a development project to find out all requirements and specifications of the product so that the project can be run strictly according to the defined project phases (Vinekar, 2006).

The successful agile product development is reached when there is frequent interaction between the developers and the customers (Conforto, 2016). The SD model shows that frequent development replications reduce the project completion time significantly in an uncertain environment where product changes are likely to occur (Glaiel, 2012).

2.5. Agile Project Management (APM)

The Agile Manifesto was first introduced in 2001 (Cooper, 2008). The essential points are described as follows: "Individuals and interactions over processes and tools. Working software over comprehensive documentation. Customer collaboration over contract negotiation. Responding to change over following a plan" (Beck, 2019). The agile project management (APM) has been used ever since and has become a cutting-edge approach used primarily in the software industry. Organizations are forced to become more competitive. Agile methods for product development become desirable as a response to the fast-changing and insecure business environment. Agility becomes a way of survival in the contemporary turbulent reality. It is of vital importance to innovate, to be able to manage changing priorities in order to meet the customer's expectations. Agile methods are used to provide value to the customers while dealing with inherent project unpredictability relying on people and their creativity rather than on processes (Augustine, 2005). APM is applied in thousands of companies around the world for software development and its popularity is growing (PMI, 2015). The winners in the rapidly changing world of manufacturing will be those firms that have mastered the agility needed to generate rapid and continuous innovation (Denning, 2013). The APM is an approach that has the potential to become usable far beyond the software industry but still there is a lack of understanding and well defined instructions how to apply approach agile in other domains, how to identify situations when APM might be a better solution and how to help organizations integrate agile practices into their traditional processes (Ciric, 2018).

CONCLUSION

Old working models of the past (e.g. mass production) are increasingly irrelevant today. The agile enterprise uses new methods to maintain its existence and to acquire new market shares. It uses any change in the external and internal environment to increase its competitiveness and uses critical moments such as new development opportunities. The agile enterprise and the agile methods for product development still have an open capacity which can be used to meet the fast-changing and often unpredictable customers' requirement in an insecure business environment.

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