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THE INFLUENCE OF VUCA CONCEPT AND INDUSTRY 4.0 ON SUPPLY CHAIN MANAGEMENT IN THE INSTRUMENT DESIGN AND ENGINEERING SPHERE

Abstract. A retrospective of VUCA concept development and Industry 4.0 is given. The world trends in the instrument design and engineering sphere are determined. The significance of VUCA strategies for the business strategy formation is highlighted. Especial importance of anticipating changes in global supply chain for the instrument design and engineering sphere with a significant number of innovative products are reflected.

Keywords: Supply chain management, international scientific and technical cooperation, Industry 4.0, VUCA, instrument design and engineering sphere, product development

INTRODUCTION

Instrument design and engineering sphere enterprises are innovative structures that use and create innovative devices. For these companies it is important to operate in the conditions of Industry 4.0, which uses the integration of cyber-physical systems in production processes. VUCA stands for volatility, uncertainty, complexity, and ambiguity, and shows us the ways to be more agile and react faster whenever we face such an environment. The experience of the pandemic and quarantine, and also the chaos which was brought to businesses by this external change, showed the importance of VUCA strategies more clearly. Due to the growth of VUCA challenges in the processes of the modern globalized world, in particular, in the conditions of pandemic crisis, it is important to note the peculiarities of their impact on the global supply chains of instrumentation enterprises.

ARTICLE GOALS

The purpose of the study is to identify and review trends in the impact of Industry 4.0 and the VUCA concept on the activities of companies in the instrumentation field.

RESULTS OF RESEARCH

Warren Bennis and Burt Nanus introduced VUCA as a concept to the world in 1985. This concept and its features were used in their book titled “Leaders”, and described how to face the external changes which can happen to the environment of our company or projects [1]. Waltraud Gläser noted that about 5 years later, this idea and the decision-making strategy related to it, were used by the US military after the collapse of the USSR. The military was using VUCA strategies and made it grow in their plans and thoughts. The uncertain situations in the military also called “fog of war” were always a challenge, and a lot of different methods were used to solve such difficulties [1]. 9/11 terrorist attacks and also the financial crisis in 2008 are examples that showed how businesses may face sudden external changes and encouraged a better understanding of VUCA strategies and how to deal with a VUCA world.

One of the main sectors which suffered a lot from this pandemic was supply chain management. The quarantine and the instability started in China about 2 years ago. However, even in time of returning to ordinary life and trying to manage this pandemic, problems still exist, and the supply chain system seems to be unbalanced still. The segmentation of the manufacturing process into tasks that imply different factorial

content and the employment of workers of varying degrees of qualification, as well as the subsequent geographic relocation of these activities, have configured hierarchical operations in which the national industries are inserted in a differentiated way.

In this process, the main actors are the coordinating entities of global value chains, generally the headquarters of large transnational companies, responsible for maximizing the profitability of the chain as a whole. Consequently, they are also responsible for the direction and coordination of a wide variety of productive activities carried out in different locations [2]. The prediction of demands became harder in the pandemic times and there are a lot of problems and uncertainty in production and supplying these demands with coordinating entities of global value chains. Suez canal obstruction is another example of VUCA world and how an overloaded ship forced supply chain companies to have at least a month of rescheduling and also hindered about 10 billion dollars worth of trade to be delivered on time.

Predicting these changes is especially important for the instrument design and engineering sphere where a significant number of innovative products are developed and used. Unlike the traditional product development model, where novelties and marketing activities are parallel processes, leading companies today use models that consider the features of product development and marketing as one element [3].

The phrase ‘Supply Chain Management’ was originally coined by Keith Oliver in 1982 and subsequently gained increasing popularity as its usage proliferated in books and language [4]. Like any other system and aspect of the businesses, the supply chain has to adjust with new trends and fast-paced changes, also continuously external distractions increase uncertainty and chances of having a failure in business planning.

Optimizing and analyzing is a vital part of supply chain management. To keep the supply chain working as planned and also efficiently, it is necessary to obtain agility and readiness in case of an interruption. Different threats around the world and unstoppable changes, which are getting more fast-paced, such as political issues between China and USA, and also some examples mentioned above, are pushing supply chain managers to reconsider their globalization market strategies. One of the responses to this challenge, which is closer to a VUCA world than ever, is to focus more on Just-in-time planning and a regionalized plan in the supply chain instead of globalization. This idea can reduce costs and also make businesses more agile, in case of a crisis. Businesses are now forced to make multiple plans, and get ready for any external changes. In this time, data collecting and also updating the system to an Industry 4.0 version seems essential.

Big data can give the companies and businesses a better vision and understanding which can make a meaningful change in supply chain management. Having a better insight in time of decision-making is one of the most important goals of each manager and the innovations they try to adopt. Supply chain management doesn't yet have the structure and motivation to update, however in the VUCA world big data analysis can be the solution to a lot of problems and also worth investing in, and gain a powerful competitive advantage. With this analysis, managers can have a better strategy, and also make their operation and inventory more efficient.

With big data analysis, the understanding of customers' behaviour can improve. At the same time, there can be much better forecasting of the balance between supply

and demand which can help to reduce the costs of inventory and even redefine inventory planning. This information can reduce risk and eliminate some of the possible bugs in the companies' plans, such as information about weather conditions or the most effective distribution system. Also some functions like temperature control for sensitive products or real-time tracking can be accessible with big data analysis in supply chain management. Another function which can help the companies to become more agile is 3D printing [5]. This method of production can decrease the costs of logistics and inventories. Their digital information can also be helpful for big data analysis and supply that function with better data sources.

The operation and production will be less time-consuming and 3D printing can help batch production as well as project production, which is beneficial for both small and big businesses around the world. The reduction of need for moving the products can significantly decrease the costs of logistics, and this change can be helpful for the environment as well. The most beneficial point of 3D printing can be lower costs for the finished goods which can give the companies a competitive advantage in terms of pricing the products.

CONCLUSIONS

A better understanding of changes in demands and fast-moving trends can be achieved better by using new technologies, which shows the value of artificial intelligence in a VUCA world, and help managers to get a chance of having a better decision-making process. A prospective direction of further research is the peculiarities of intellectual property relations in the sphere of instrument design and engineering in the conditions of the Fourth Industrial Revolution and implementation of certain aspects in Ukrainian legislation.

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