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PROSPECTS FOR THE DEVELOPMENT OF INDUSTRIAL 4.0 PROGRAM IN UZBEKISTAN (ON THE EXAMPLE OF A LEATHER SHOE MANUFACTURING ENTERPRISE)

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Abstract

This article examines the essence, advantages and application of information technology in the production of Industry-4.0 program for manufacturing enterprises. The research work of a number of leading experts in the field has been analyzed. The issues of implementation of the Industry-4.0 program in the network of leather footwear enterprises in Uzbekistan have been studied, problems have been studied and proposals and recommendations have been developed to address the problems. The scores of experts on the need for digitization in the manufacturing industry, as well as the high and low indicators of the manufacturing industry were determined. The results of the study serve as a basis for the formation of a scientific conclusion that there is a need to introduce digitalization in the manufacturing industry.

Keywords: automatization, digitalization, digital economy, industry 4.0, IoT, blockchain, 5G Internet, production.

Introduction

If we look at the economy of Uzbekistan, we must admit that we are now at the stage of transition from the level of "Industry 2.0" to "Industry 3.0". Of course, this situation is a serious obstacle to the complete modernization of Uzbekistan's industry. Obviously, acknowledging and understanding the problem is a step forward.

President Shavkat Mirziyoyev declared 2018 as "The year of supporting active entrepreneurship, innovative ideas and technologies" in our country. In addition, the President defined a strategic plan to include Uzbekistan in the ranks of the 20 developed countries in the world. In order to achieve this huge and universal goal, it will be necessary to fundamentally change the economy and industry of Uzbekistan and widely implement the principles of "Industry 4.0".

In particular, the Decree of the President of the Republic of Uzbekistan dated November 12, 2021 No. PQ-9 "On measures to implement the project "Financial support of small and medium-sized businesses"¹ with the participation of the German Development Bank" by its decision, the Republic of Uzbekistan strengthened agriculture, as well as all spheres of the economy, including the support of business entities in the field of agriculture, and the further expansion of cooperation with the German Development Bank.

In the same way, in accordance with the tasks defined in the state program on the implementation of the five priority directions of the development of the Republic of Uzbekistan in 2017 - 2021 in the "Year of Science, Enlightenment and Digital Economy Development" and the wide introduction of modern information technologies in the economic sectors and public administration system and in order to further increase the

120 ¹<https://lex.uz/docs/5726373>

competitiveness of the republic’s economy by expanding telecommunication networks, additional tasks of further development of the digital economy and electronic government were determined [1].

It’s no secret that Industry 4.0 is one of the important and basic directions in the digital economy system. In Uzbekistan, among the developed countries, it is necessary to put the Industry-4.0 program into practice in order to put the macro-economy into a single digital system and digitize the physical activities in it through cyber-physical systems. It is impossible to implement a perfect digital economy system without implementing this program. The reason is that digital enterprises are recognized as SMART factories in international practice. Smart factories are based on the 4th industrial revolution.

The role of modern technologies in the digitization of small business entities is of great importance. In particular, during the implementation of the Industry 4.0 and Internet of Things (IoT) strategies, rapid market growth can be observed in the areas of services around Big Data and digitization [2]. The introduction of such new technologies allows the Uzbek industry to experience competition (for example, high quality through modern information, speed of service). Smart and networked systems, products and processes enable high product quality with optimized use of resources. In addition, digitization is creating completely new business models for manufacturers. On the other hand, an industry may be in a state of transformation due to changing boundary conditions. These factors include progressive globalization, dynamic product cycles, limited natural resources, climate change, and demographic change [3]. Leveraging digital technologies can help companies anticipate these factors. However, since the introduction of the Industry 4.0 strategy in 2012, many small businesses are still struggling to digitize their businesses. Various studies show that there are many obstacles to the implementation of this strategy. Frequently mentioned obstacles are high investment costs, costs of expertise and personnel, time consumption, abstract needs because monetary benefits are difficult to quantify, lack of qualified personnel, data protection, infrastructure and interfaces or long waiting times.

These day business markets are looking for modern manufacturing technologies to find rapid response to the high demands of variability, efficient supply chain and optimized energy consumption. As a solution, Industry 4.0 takes advantage of the integration of modern manufacturing technologies and information systems to advance production capabilities. In this regard, smart manufacturing enhances long-term competitiveness by optimizing labor, energy and materials to produce a high quality product, and finding a quick response to changes in market demand and delivery times in a constantly changing world, it is important to find ways to quickly overcome new challenges [4]. You need to adapt, react and act quickly. Surprisingly, there is no single solution to any problem. But there is one concept that is worth striving for and becoming a smart company. A new way of thinking and the concept of acquiring skills and competencies that allow for quick adaptation to a changing environment and thus sustainable growth for your company. A smart company is not a trend or a simple word, but a clear concept. Even if a smart company does not belong to a particular technology or system

Companies that are no longer engaged in the precise implementation of Industry 4.0 are at risk of missing out on competition. When it comes to implementing industry 4.0 solutions, speed is very important. While personal successful examples show what opportunities exist in the implementation of Industry 4.0, there are still many companies that are not sufficiently engaged in the potential of Industry 4.0

The Industrial Revolution in the form of Industry 4.0 is one of the most important economic development factors of our time for manufacturing companies. The development led to the operation of the steam engine (industry 1.0), the assembly line (industry 2.0), and

automation (industry 3.0). Digital change is changing the future of the manufacturing world. Today, Industry 4.0 technology aims to manage all production processes through advanced Internet services [5].

Modern digitization allows many factories to organize their work processes in production. Machines need to communicate more independently with each other using new technologies and thereby increase production. Combined with the perfect organization of work, fast work promises to save time and costs.

Thanks to the latest automation, production processes can be controlled using robots. With the help of leading IT systems, communication can be established between individual machines on a digital level. The exchange of information allows them to organize and work independently.

Connected systems create the ideal collaboration between man and machine and strengthen the “brain power” and “workforce” of its operators. In addition to manufacturing, suppliers and customers also benefit from new technology. Network systems allow for the immediate recognition of unexpected faults and deviations. This technology allows for a quick response in production. Industry 4.0 has following conveniences:

- ❖ Reduction of production costs;
- ❖ Intelligent value chain optimization;
- ❖ Increase in income;
- ❖ Strong competitiveness;
- ❖ Great flexibility in production;
- ❖ Common point to the whole supply chain;
- ❖ Sales growth;

Currently, about 30 percent of German companies claim that the 4.0 industry is of great importance. More and more companies are seeing a trend towards a fourth industrial revolution. In the near future, the development of modern digitalization will continue to grow. In two to three years, Industry 4.0 relevance is expected to grow from 29.3% to 35,4%. The leading segments in the German industrial 4.0 solutions market are the following segments: hardware, software and IT services. IT services have the greatest growth potential and thus the highest sales. They are worth 3,564 billion euros, an increase of 22,2%. Software is in second place with 1,195 million euros, up 23,8 percent. Under it, the trade turnover amounted to 1,111 million euros and is growing by 14,2%.²

Review of Literature

Scientific studies show that Industry 4.0 has a positive impact on sustainability. In particular, the conducted research can contribute to the economic efficiency of the goal of developing environmental and social sustainability, which explains the processes of industrial digitalization, as well as the main technology trends and design principles, and provides an interpretive model of the sustainability function of Industry 4.0.

Zuzana Papulova, Andrea Gazova, Lubomir Sufliarsky in their study “Implementation of Automation Technologies of Industry 4.0 in Automotive Manufacturing Companies” found that sensors and programmable devices are the most used elements in the automotive industry, and large manufacturing companies implement automation elements at a more advanced level than small and medium-sized enterprises. determined to increase. In general, since smaller companies are limited, especially with financial resources, we can show opportunities in the form of cooperation with external partners, research institutions, universities or business incubators [6].

Vial defines digitization as “the process of improving an object by making significant changes to its properties through a combination of information, computing, communication and connectivity technologies” [7]. The digitalization process has become the basis of competitiveness in the business and industrial environment. In order to use the potential of the digitization process to their well-being, goals and benefits, managers must deal with the complexity associated with Industry 4.0 in different dimensions [8].

Toanca noted that creating a digital strategy is at least as important for small and medium-sized businesses as it is for large ones [9]. But there is still literature on how managers should approach digital transformation, how they should work, and how they should implement related strategies [10]. Especially in this study, Industry 4.0 refers to the digitization of production, so digital transformation can be considered as the main concept and Industry 4.0 as a sub-concept [11]. After the Industry 4.0 discussion in Germany in 2011, the smart factory in Korea received a lot of attention. Since 2014, smart factories have been established and expanded in Korea. However, about 80 percent of them are organized at a low level. A detailed analysis of smart factory cases was conducted through empirical research on 113 manufacturing companies that established smart factories in Korea [12]. We build a framework on the resource-based view (RBV) and the IT value creation process, and analyze the results of the five constructs of manufacturing strategy, organization, system, process, and performance using basic statistical methodologies to obtain the current state of manufacturing. The results show that it is very difficult to implement modern technologies such as artificial intelligence technology that performs quality control of semi-finished and finished products, optimization of production processes and product demand forecasting. We also know that protecting and managing object data is a difficult challenge. In addition, while production and materials management rank high, it is well known that the use of integrated systems, which are important in building a smart factory, is very low. Finally, the benchmark results show that revenue management and defect rates are most important when job creation through smart factory penetration is low. Based on the results of this research, the government can determine an effective smart factory policy and provide manufacturing companies with a guide to create a smart factory.

Methods

To study the issues raised in the scientific article, to study in detail, to analyze the figures, to study the interpretation of Industry 4.0, its driving forces and obstacles, to develop proposals and recommendations systematizing the results of the analysis, induction, deduction, observation, comparison, Research methods such as SWOT-analysis, expert evaluation, targeted development were used. Based theory is aimed at developing comprehensive explanations of a particular phenomenon. The method is usually used to generate theories based on data collected and analyzed on a regular basis.

Results

It comes to Industry 4.0, very few people think of “shoes”. Because this industry is not sufficiently developed in our country. The study examined several small shoe factories in Kokand. In these small businesses, almost all of the production process is done by hand.

Industry 4.0 is undoubtedly the fundamental foundation of the future economy. In addition to engineering devices or economic calculations, it also includes information programs and the Internet. Numerous studies have been conducted around the world to draw conclusions on this issue. That is, to implement Industry 4.0, the following basic additions to Industry 3.0 will be required [13]:

- ❖ Industrial application of Internet of Things (IoT);

❖ Completed real database (used for various purposes, including the selection of various parts of the structure in the warehouse, instructions for repair and maintenance of equipment);

❖ Large amount of information and business analysis (analysis allows you to work with large amounts of information, which allows you to increase the performance of equipment and save energy, optimize product quality);

❖ Cloud technologies (used by advanced companies in solving problems. When working with large amounts of information, it is necessary to improve cloud services);

❖ Autonomous work (independent processing of information by the system and independent drawing of standard conclusions);

❖ Horizontal and vertical integration of systems (organization of close cooperation between partner enterprises within the enterprise and in the production cycle at different levels);

❖ Information security (cyber security, secure access, reliable communication, full control over access to management networks);

❖ Additional production (achievement of industrialization of additional technologies, as well as the use of 3D printers for the creation of prototypes and the production of individual parts);

❖ Digital modeling is one of the basic directions of implementation of the program Industry 4.0. Transforms the physical world into a virtual model. This is also called a cyberphysical system in the scientific field. This system digitizes every physical movement in the enterprise.

Industry-4.0 has rapidly entered the world of business and is one of the largest projects in developed countries. This can be seen from the fact that 74% of trade in the robotics industry is accounted for by five countries: China, Japan, South Korea, the United States and Germany³.

In order to implement the Industry-4.0 program in Uzbekistan in the production of leather and footwear, it is necessary to first analyze the current state of this industry. The leather and footwear industry accounted for 1.1% of the manufacturing industry in 2016, 1.2% in 2017, 0.9% in 2018 and 0.5% in 2019. In 2020, compared to 2019, the export volume of industrial production increased by 115%.⁴

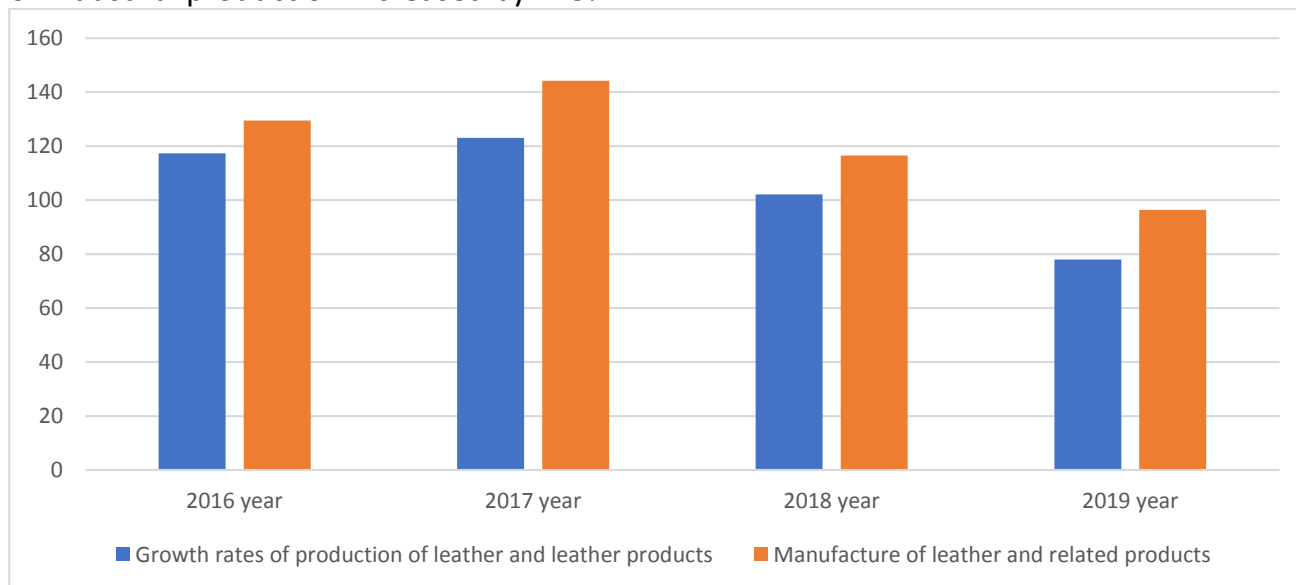


Diagram. Production volume of leather and leather products (%)

³ <https://www.scopus.com/record/display.uri?eid=2-s2.0-85087529712&origin=resultslist>

⁴ <https://api.stat.uz/api/v1.0/data/ishlab-chiqarish-sanoatining-tarkibi?lang=uz&format=xlsx>

Compared to 2018, the growth rate of production of leather and leather products decreased by 21% (in 2018 this figure was 102.1%), the volume of production of leather and leather products decreased by 20.08% (116 , 49) can be seen.⁵ The volume of production of leather and leather products in the industry of Uzbekistan poses financial and organizational problems in the implementation of Industry 4.0. This is due to the fact that the country does not have enough leading IT specialists, the energy system is not in demand, the cost of IT equipment is expensive, and the volume of production of leather and leather products in 2019 amounted to 0.5% of the manufacturing industry. the output volume should be at least 5-6 percent. To do this, it is necessary to support investors with benefits and preferences created by manufacturing enterprises. The growing share of high-tech enterprises in the structure of industrial enterprises will increase the chances of implementing the Industry-4.0 program in Uzbekistan [14].

At the heart of the Internet evolution in the industrial world today is the interconnectedness of systems to offer faster data transmission and processing to meet the industry's growing agility needs. IoT (Internet of Things) is one example of the innovations made as a result of the development of web technologies and techniques.

IoT plays a central role in the interconnection of machines, various systems and information systems. The technologies associated with this concept allow data to be collected from factory-centered or decentralized machines and returned to the information system. There are many hardware or software solutions around IoT problems today. For example, it is now possible to convert one or more sensors to IoT using intelligent acquisition modules adapted to the various communication protocols associated with this technology. The amount of data collected due to IoT no longer allows traditional IT infrastructures to efficiently store or process data. Cloud and Big Data are the answers to these questions.

As a result of the development, the digitalization of the production process will inevitably lead to the need for information security. It is advisable to use Blockchain technology to solve this problem. Blockchain is a "cryptographic-based computer protocol" that enables the security of data that is transmitted digitally from a single data source and intended for a single receiver. All of these processes are "distributed" over the network, which reduces the risk of errors or corruption. Today modern technology brings innovations in the field. For many of them, use is still in its infancy, but new technologies are emerging and contributing to the changes that have begun in the industrial world. When we use Big Data in the manufacturing industry, we need a high data rate.

Although the 4G network is not yet fully established in Uzbekistan, the 5G network has already undergone several tests. 5G is a wireless technology that seeks to meet the exponential needs of the telecommunications industry [15]. It has 100 times faster data transfer than 4G. This technology is very responsive to the growing challenges of data communication, which is driven by the growth of new data rates, especially smartphones and the devices connected to them. 5G standards are not fully defined, but prospective tests have already been carried out:

- ❖ In 2013, Samsung announced that it had achieved a speed of 1 Gb / s.
- ❖ The University of Surrey in the UK announced that in 2015 it reached a speed of 1 Tb / s.
- ❖ Ericsson achieved a 50-fold increase - up to 5 Gbit / s.

❖ Samsung has reached 7.5 Gbit / s with a stable 1.2 Gbit / s signal on a high-speed moving machine.

❖ Japan's NTT DoCoMo achieves 10 Gbps in partnership with Alcatel-Lucent, Ericsson, Samsung and Nokia.

SWOT analysis of the implementation of the program Industry 4.0 in the leather and footwear industry⁶

S	<ul style="list-style-type: none"> - Has a sufficient raw material base. - Good quality of raw materials - High demand for the product. - Cheap labor. 	W	<ul style="list-style-type: none"> - The volume of production of leather and related products is a small part of the industry. - There are not enough financial resources. - There is a shortage of staff in this area. - Internet speed is low. - IT devices are expensive. - The development of Internet of Things (IoT), new modern communication technologies is not at the level of demand. - Scientific grants in this area are almost never designed by the state and other organizations. There are very few projects being implemented in this area.
O	<ul style="list-style-type: none"> - There are foreign investors interested in entering the business of Uzbekistan. - There are great potential for the implementation of Industry 4.0. - The results of the program will accelerate economic growth. - The cost of leather and footwear products will be reduced and transaction costs will be reduced. - Increases competitiveness in the international market. - Prompt state support. 	T	<ul style="list-style-type: none"> - Unemployment will increase. - The probability of leaking confidential information increases.

The implementation of the Industry-4.0 program in the leather and footwear industry of Uzbekistan was analyzed using the SWOT method. The introduction of Industry-4.0 into production has almost no risks. Not can we be proud of the strengths of implementing this program. However, the implementation of Industry 4.0 will bring great benefits. This can be seen in the breadth of possibilities. However, there are serious weaknesses in the implementation of this program, and it is necessary to start with solving these problems.

While international experts have been advancing theories of Industry-5.0 since 2017, the introduction of Level 4 industry in Uzbekistan's industry remains problematic. Today, it is difficult to say that the newly established industrial enterprises also operate at the level of Industry-4.0. Because, implementation of Industry 4.0 requires at least 4G Internet quality in all industrial areas of the country. If the number of such industrial enterprises increases,

there will be a need to switch to 5G Internet. However, the quarantine announced in Uzbekistan as a result of the pandemic has shown that the speed of the Internet has decreased as a result of the simultaneous use of the Internet by a large part of the population. This will be one of the biggest obstacles to the implementation of the digital economy or Industry-4.0, of which it is a part. In addition, information security in Uzbekistan is not commendable. This can also be seen in the frequent hacking of the websites of government agencies by various users.

Discussion

Recent technological developments have made digital technology cheaper, more user-friendly, and more robust than ever. It is now easier and more economical for businesses of all sizes to invest in these technologies. Therefore, the implementation of this program, in turn, causes a number of problems:

First of all, as mentioned above, the speed of the Internet in our country is not satisfactory. As you can see, there are a number of issues with storing data in the cloud or using cloud data. The cloud is made up of many technologies that allow remote computer servers to use computing and storage power. Thus, the cloud allows you to outsource it in whole or in part, instead of having local IT infrastructure. Often cost rationalization and billing to consumers will be more beneficial than owning and maintaining your device.

In the industrial sector, the cloud has opened up new opportunities:

- ❖ Feedback of data from different production points to the centralized site;
- ❖ Processing large amounts of data at low cost. (The larger the data size, the greater the computing power. The cloud allows this power to be rented);
- ❖ Storage of large amounts of data;

Cloud technologies integrate seamlessly with the new needs and constraints brought about by Industry 4.0, and enable support for changes in the information system through needs-tailored investments. The cloud responds appropriately to the limitations of storing and processing huge volumes using Big Data.

Second, the proliferation of data and the fact that management and production systems connect not only the factory but also customers or suppliers to the system poses a security problem. When technologies were connected to the company's internal network and centralized in a single building, it was easier to counter strategic information breaches. However, today it is much more difficult to protect data that is localized and accessible via the Internet.

Third, the energy system in our country is in a deplorable state. Manufacturing enterprises are at great risk once they are automated and converted to digital technology. This is because if there is a power outage, the system will shut down, which will have a serious impact on production. Fourth, it will undermine the international branding of the training system. Delays in the introduction of Industry 4.0 impoverish labor market demand. This does not encourage educational institutions to work on new knowledge. Young people, on the other hand, are not motivated to acquire new knowledge. In addition to being a weak point in competition, it also leads to a natural weakening of the social sphere.

To solve such problems, first of all, it is necessary to analyze the readiness of Uzbekistan to implement Industry 4.0. The pandemic has shown that the Uzbek economy, existing systems and population are becoming one of the strongest countries with the ability to rationally solve any problems and have sufficient immunity. It also pointed out some of

our shortcomings. In particular, the suspension of all government agencies and businesses during quarantine has led to an increase in leisure time and increased use of the Internet. After all, it can demonstrate the quality of Internet speed.

In conclusion, in order to overcome the above problems, it is advisable to implement the program Industry 4.0 with the following solutions: First, to improve the quality of the Internet for the sustainable operation of IoT, cloud technologies, cyber security, 5G Internet and 3D technologies, including by radically reforming the technology of telecom operators, communication cables and telecommunications networks and creating a modern service. to achieve.

Second, the development, use, improvement and monitoring of the effectiveness of information security tools to ensure data security, the development of secure telecommunications systems, increase the reliability of special software, information security equipment and automated information in accordance with information security requirements improving the software certification system for processing systems, identifying technical devices and programs that threaten the normal operation of information and telecommunications systems, and developing an effective way to combat them.

Third, in order to develop the energy system, it is important to increase the number of wind power plants, a device that converts the kinetic energy of wind current from electricity from solar cells based on semiconductor photocells. Given that wind farms are often used as a source of electricity in areas with high average annual wind speeds (greater than 5 m / s) and far from centralized power grids, this figure is particularly relevant for the Fergana Valley. This can generate 8 kW to 1.2 mW of electricity at a wind farm.

Fourth, in order to increase the number of IT staff in the country, increase the number of IT classes in schools, the introduction of modern programming languages in the curriculum, improve the quality of their Internet access in order to increase computer literacy among students, network supply. Organization of various online platforms for training computer programmers (One million Uzbek coders), presentation of various grant projects in the field of IT. Radical reform and reorganization of existing IT parks with the involvement of skilled workers. This is because most IT parks are staffed by unskilled workers, and as a result, IT parks do not achieve any results.

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