

Application and Development Trends of Digital Technologies in Modern Production Management

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Abstract: The study relevance is due to the fact that the global digitalisation process has affected all areas of society life. Hence, this article is aimed at revealing topical issues related to the application and development trends of digital technologies in modern production management in Malaysia. The study purpose is to identify the main modernised technologies applicable at various enterprises in Malaysia, to analyse their impact on the entire production management process. The main tasks were solved for this: the key requirements for modern digital technologies at enterprises were analysed, the current state of entrepreneurship in Malaysia as a whole was characterised, and the methods for improving the management process at enterprises were suggested. The main study areas are predetermined by the insufficiency of theoretical and methodological development of this issue, its increasing practical significance. The leading method for studying this problem is the analysis of the most popular and effective digital management technologies, determining the need for their synthesis in the management process, and analysing the prospects for the digital technologies' development in general. The materials of foreign specialists were studied, which make it possible to comprehensively consider the importance of digital technologies introduction into production management in modern conditions. As a result of the study, the main popular digital technologies in the production management industry were considered, based on current trends in this area, scientific materials of popular specialists.

Keywords: Economy, Digitalisation in Entrepreneurship, Production Processes Digitalisation, Management Decisions, Digital Transformation.

JEL Codes: Q55; E23; G30.

1. INTRODUCTION

Digital transformation is the main factor in the development and promoting of competitiveness of the national economy in global markets today. Creating a digital enterprise that uses modernised information technology as a key factor in competitive advantage is the main digitalisation area. The need to introduce modern technologies in production management is due to the fact that digitalisation significantly affects the competitiveness of an enterprise in the market by reducing certain costs and optimising management processes (Ligonenko et al., 2022; Naumenkova et al., 2022).

The problem of application and development trends of digital technologies in modern production management is also quite popular in the scientific community. This issue was studied by such specialists as: S. Muhamad et al. (2021), S. W. Gan et al. (2018), M. Ghobakhloo and Ching (2019), C. S. Seah et al. (2021), B. Mat et al. (2019), Y. X. Loh et al. (2021).

Thus, Y. X. Loh et al. (2021) in their publication claim that the development of economic, digital, innovative aspects is

an interesting study object for the countries of Southeast Asia, which are an example of active growth in many industries and areas. In the publication, the author also mentions that Malaysia is the largest country out of the ten member states of the Association of Southeast Asian Nations. Therefore, the processes and changes happening in the regional economy of Malaysia can, to one degree or another, set development trends in other countries.

According to Ghobakhloo and Ching (2019), the digital economy expands the production possibilities. The occurrence of a variety of innovative digital technologies has significantly changed all entrepreneurship areas. The digital transformation concept is also quite popular in current business mass media. Gan et al. (2018) states that the digital economy implies a fundamental change in management models by using digital technologies. Therefore, it is the modernised technologies, their introduction and popularisation that contribute to changes in the modern economy and public activity (Tonkha et al., 2018). In addition, under the influence of the digital technology's introduction in production processes, the managerial decision-making behaviour is also changing. An impressive amount of information that arises at each production management stage requires the introduction of modernised digital tools that create a digital infrastructure (Babak et al., 2019; Semenenko et al., 2022).

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Muhamad et al. (2021) in their publication say that digital transformation allows increasing the level of productivity, resource efficiency, and modeling innovative business technologies. The author is convinced that in the next five years, digitalisation will bring about 30 billion euros of added value at the global level and an additional 40 billion euros of annual investments in production processes through modern digital products.

Seah et al. (2021) says that currently the global economy is ultra-competitive. The requirements for modern information technology are changing very quickly. In such conditions, the combined and systematic application of digital technologies with account of all the features of managerial decision-making and the achieved development level of the digital environment, creates a unique infrastructure for the enterprises activities of various levels and areas, which opens up new economic opportunities for productions, ensures the achievement of a high level competitiveness, improves the quality and efficiency of managerial decision-making in the digital economy (Kanatay et al., 2019; Mustafin, and Kantarbayeva, 2021).

Digital production management is the realities of the modern world. Mat et al. (2019) is convinced that the application of digital technologies in production management is a necessity in modern conditions. Due to them, every management stage improves, production becomes modern, which has a beneficial effect on all business processes and the results of the enterprise.

Thus, the purpose of this study is to analyse the development trends and features of the digital technology's application in modern production management. The study object is innovative digital technologies that are used in various enterprises in Malaysia.

2. MATERIALS AND METHODS

In this article, the methodological approach basis is the analysis method. Fundamental in the study are the theory provisions of sustainable production development in the context of a complete digital transformation of all industries and areas. The introducing digital technologies concept in the context of the management process was considered. An important study area is also the formation of the combined approach that will contribute to the further modernisation of the Malaysian entrepreneurial system. To determine the introduction significance of modernised digital products, data analysis was carried out and a comparison of the results obtained with the materials of other specialists was made. This study also showed a review of published academic literature and relevant documents.

The study involves determining the significance of modern digital technologies, analysing key approaches that imply trends of their development in production management. This scientific study was carried out based on a previously prepared basis, which serves as the foundation for further studies.

The scientific methodology of the study is based on a systematic approach to the problem under study and a comprehensive processes consideration of digital transformation of production management methods. The methodological basis

was the works of Malaysian and foreign economists on theoretical issues of the effectiveness assessment of modern management techniques. Scientific generalisation, limitation method, methods of statistical, causal and comparative analysis were also used as study methods.

The theoretical basis of this article is the results of studies conducted by a number of Malaysian and foreign specialists, which were aimed at studying the problems connected with identifying those innovative technologies that are fundamental in the modern production management. The presented research work was carried out in three main stages.

At the first stage of scientific study, an appropriate theoretical basis was prepared, which was used as a foundation for further scientific studies. A systematic analysis of the main aspects of innovative technologies introduction was also carried out, it was found out that they significantly affect the management process and the entrepreneurial system of Malaysia as a whole. The key issues that can be optimally solved with the help of the practical introduction of such modern study methods as analysis, synthesis, modeling, analysis of thematic literature and documentation are outlined.

At the second stage of the research work, an analytical study of the actual problems of innovative technologies application in production management, which are currently key in the entrepreneurial environment, was carried out. In addition, the analogy method was used. The analogy method assumes, based on establishing the similarity between several objects in a number of essential features, that one of the study objects has a specific feature. At this stage, an analytical comparison of the results obtained with the conclusions of other scientists involved in the practical development of issues connected with the combined approach for studying aspects of the modernised digital technology's introduction in modern conditions was made.

At the final stage of the research work, based on the obtained results, the results of the scientific study were made, that are acting as a data display of these results and generally determining the main trends of the further development of digital technologies in the production management industry. The study is limited by the conditions of the complete digital transformation of all industries and areas in Malaysia.

3. RESULTS

Digital transformation has currently affected all areas of social life, because it is a key factor in the development and promoting of competitiveness of the national economy in global markets (Mat et al., 2019). One of the areas of digitalisation currently is the creation of an innovative digital enterprise, the main tool of which is modern information technologies used as a fundamental competitive advantage. The need to apply modernised digital technologies in production management is due to the fact that digitalisation can significantly increase the competitiveness level of an enterprise in the market by reducing production costs and optimising business processes (Kisiołek et al., 2021). It is also important to emphasise that the use of digital technologies involves a complete transformation of communication systems, the organisational structure as a whole, and existing management

methods. As part of the study, it is also possible to consider the key concept of digital transformation of foreign enterprises, which includes such components as:

- Industry 4.0 that involves the application of cyber physical systems in production and public life;
- the aspects of the smart production, which means the most intensive introduction of network digital technologies at all stages of production and products delivery, and involves the use of such technologies as, for example, cloud service, smart robotic technologies, industrial internet of things;
- digital production as an integrated system that includes analytical and numerical modeling tools, which are based on the concepts of flexibility, manufacturability, economy;
- Internet in industry, which implies production remote control based on the use of specialised software and a system of interconnected computer networks;
- open production (Muhamad et al., 2021; Koh et al., 2019; Babak et al., 2020b).

Due to the digital economy development industries have the opportunity to join the global ones. The main value of the digital enterprise is in the fact that the principle of customer focus becomes the most significant, because currently the customer has the opportunity to independently choose the necessary product, based on personal experience or feedback. Today, the seller does not have the opportunity to personally influence the customer.

The development rate of the digital economy is rapidly speeding up every year, according to forecasts of some experts by 2025 from 80% to 100% of world production will be covered by artificial intelligence technologies (Muhamad et al., 2021; Korzyk et al., 2020). A key factor in the digital economy development is a focus on a specific consumer, the comprehensive use of information and modernised digital technologies that can globally transform traditional management models, production chains, and contribute to the occurrence of new innovations and products on the market.

Speaking about the economy of Malaysia, over the past decade, the gross domestic product (GDP) of this state has shown sustainable growth, although with a falling trend, but exceeding the global indicator (Loh et al., 2021). During this period, it has almost doubled. It should also be noted that the service sector in Malaysia is more than 50% of GDP. However, at the same time, the rate of population growth is declining, which, according to experts, is due to the fact that young women in Malaysia are increasingly choosing a career. However, the state is dominated by a young population.

From the very beginning of the “Vision 2020” state program introduction, the Malaysian government began to build an innovative economy (Loh et al., 2021). The specifics of the state economy, its open nature and structure oriented towards export activity, determined the specific features of the innovation segment development, among which are such features as, for example, the absence of fundamental scientific study centres, the involvement of both foreign companies and international study centres based on the tax and non-tax ex-

emptions, the development of private and state entrepreneurship at the same time.

Information and communication aspects are the key factors for the growth and development of the Malaysian economy, as well as other countries of the Association of Southeast Asian Nations and the world (Seah et al., 2021). Malaysia, like most high growing Asian countries practices the export of capital and technology to less developed countries. Africa is an example in this regard. There is a significant shortage of specialised technicians in the Malaysian labour market, despite the high demand for jobs in the information and technology industry. Recently, technology has advanced rapidly, but employees in some industries have yet to take steps to acquire new skills, creating a specific gap.

For further development, the digital economy of Malaysia should become an innovative fact in the development of the national economy and society, a solid foundation for the state to enter the system of the international division of labour. However, most of the country’s enterprises are less actively introducing digital technologies. This has caused some problems in the digital area formation.

A digital age enterprise is an organisation that uses advanced technologies as a competitive advantage in all areas of its activities. This applies to such areas as, for example, marketing, business processes, production, and customer service. It can be said that in this way a certain digital thinking appears in a standard company. Currently, the introduction of advanced technologies in production management is a necessity. First of all, these solutions allow production to compete in the market. It can also be noted that in this way the process of production management itself is significantly improved, which has a beneficial effect not only on all business processes, but also on the results of the enterprise activity and manufactured products (Trusova et al., 2021).

The digital economy expands the production possibilities. Standard enterprise digitalisation is a rather long process. This is due to the fact that the traditional enterprise management system, which is currently in force, has been built over the years. For high-quality and effective introduction of robotic technologies, readiness will be required not only from the manager, but from the entire team. In addition, it is important to correctly select a key strategy that will best meet the requirements of modern business.

In this issue, special attention should be paid to the transformation of ongoing advertising campaigns, which also involves the introduction of digital technologies. At the initial stage, it is necessary for the company to have its own Internet resource, which would contain transparent information about the enterprise and activities. At the same time, it is important to emphasise that the information must be updated periodically so that the customer has all the necessary latest data. Important for digital production management is also the introduction of electronic document management in enterprises (Babak et al., 2020a). The value of this technology is in the fact that the risk of making an error in the filled documentation is minimised, and its sending will take several times less time than with standard documentation. Today, electronic document management is a key technology for digital enterprises. It should also be noted that the presence

of an electronic digital signature makes this technology not only effective, but also safe (Mukhamediyarova et al., 2021).

Digital production management is also connected with great risks. This, in turn, is due to the fact that many enterprises introduce ready-made solutions in their activities, which may not be comparable with the requirements of a particular business. As a result, the manager may experience certain failures. Thus, for modern enterprises in Malaysia, it is necessary to develop new solutions specifically for a specific production. In this case, after a preliminary analysis, possible risks will be minimised.

Based on the abovementioned, it can be concluded that in order for the traditional enterprises of Malaysia to be considered digital by right, the management should realise that the application of advanced technologies should occur in all managerial production processes. Often, management applies these solutions to a particular production area, while expecting fast, visible results. This policy is considered highly misguided. In addition to the abovementioned, it is also important to consider the current and future purposes and objectives of the enterprise. It is important to introduce such technologies in digital production management taking, considering the experience of competitors or based on the experience of enterprises engaged in a similar activity type. An analysis of their experience will allow building a high-quality policy for the advanced technologies introduction and minimise the most common problems of digitalisation. To some extent, the transition of enterprises to a new digital age for many enterprises is daunting. However, for those who can develop an effective development strategy, more opportunities will be open (Boikova et al., 2021; Brodny and Tutak, 2021).

The digital economy requires the use of a large amount of resources. However, observing the experience of foreign countries, it can be said that all costs pay back in the long term. An example is the development of entrepreneurship in China and the impact of digital transformation on it. China is recognised as a world leader in the e-commerce industry, which is based on small and medium enterprises. Digital transformation in China has caused the market to shift from the dictatorship of big companies to the growth of the influence of small businesses. A similar process is still under development in Malaysia. The trend in the development of digital technologies is such that most small enterprises and innovative organisations will receive the maximum number of benefits from the use of such solutions (Asauliyuk et al., 2017; Mishchenko et al., 2021). At the same time, big businesses will need to quickly and mobile adapt in a world of continuous digital innovation.

Currently in Malaysia, there is a gradual process of complete digital transformation of all industries and areas. The managers of most enterprises are beginning to study, master and introducing in their production the most popular key technologies that contribute to digitalisation:

- Internet of things is the ability to connect devices and objects to the Internet for remote control that allows modeling new applications, business models, services based on data collected from connected devices;

- new generation wireless networks;
- cloud computing is a technology that involves open access on demand to a number of online computing resources;
- big data system is information characterised by high speed, amount and variety, often obtained from the Internet of things;
- artificial intelligence is the ability of technology and systems to adopt and acquire knowledge, including the performance of certain cognitive tasks, such as: object identification, perception, learning, language processing, assumptions and forecasts development, decision making;
- blockchain is an electronic spreadsheet or account book that is stored on a computer and regularly updates the database, makes identical copies which allows all participants to see and check the records (Seah et al., 2021; Li et al., 2021; Latifi et al., 2022).

It should be said that the digital economy expands the production possibilities. Digital production management provides the manager with many opportunities, but specialists state that currently a limited number of entrepreneurs are fully using the benefits of the digital economy. Therefore, currently there is a kind of gap in the rate of introduction of advanced technologies between small and medium enterprises, large companies. Prospects and trends in the digital technologies development at the moment have no restrictions. Due to them, there is an opportunity for enterprises to enter new markets, increase the level of productivity by reducing operating costs of production. Also, digital production management provides many benefits for managers, such as: improved access to market research, reduced cost of operating options for customers, improved customer relationships through social networks, creation of new sales channels, improved ability to find and develop the production reputation with investors (Lichtenthaler, 2021; Korzhyk et al., 2021; Siuta-Tokarska et al., 2022). The managers of most enterprises in Malaysia should learn foreign experience in the introduction of digital technologies in production management and apply key popular technologies in enterprises.

4. DISCUSSION

The globalisation age has marked the rapid development of advanced digital technologies based on the information revolution and peculiar processes of economic globalisation. The digital age has contributed to the formation of a special type of entrepreneurship based on those factors and features that are completely different from traditional ones. Yong et al. (2021) in their publication emphasises that all the changes have provided a number of opportunities for those entrepreneurs who are ready to adapt to the new conditions connected with the application of digital technologies.

Abudaqa et al. (2022) believes that the digital revolution of the new age has radically changed the forms of managerial activity and provided new opportunities for the implementation of new business ideas that serve as the basis for a favourable investment climate. Such activity forms have dif-

ferent distribution dynamics and often lead to completely different models of growth and development. Speaking about the state role in this process in the context of digitalisation of enterprise structures, it should be noted that it generates and introduces innovations into production.

Digital production management involves the transformation of business management models through the application of advanced technologies. Therefore, it is digital solutions, their development, mass use and introduction that are the main factor of cardinal changes in modern society and economy. However, Azhar and Shakil (2021) notes that they can only be used in a certain environment, a kind of digital infrastructure that ensures their development, functioning and application in management processes.

Today, managerial decision-making is radically transformed. This is due to the integration of digital technologies into this process. Jawad et al. (2021) emphasises that in the period of globalisation, a huge amount of information that accompanies each of the stages of making and implementing a managerial decision requires the introduction of modern digital tools that form a digital infrastructure.

Hasan et al. is convinced that new opportunities, cost reduction, all of this open up additional entrepreneurial opportunities. Reducing the cost of starting and conducting your own business makes digital entrepreneurship more accessible to more people with a small level of capital (Hasan et al., 2022; Kamborova et al., 2014). However, lower barriers to entry are predicted to lead to increased competition. This is a rather important question, because competition can negatively affect the survival of a business. Therefore, it is irrational for the government to direct available resources to support managers with low chances of success in competitive industries.

Thus, Tay et al. (2021) says that digital production management can also contribute to productivity growth through the application of innovation and cost reduction for certain business processes. The greatest impact on the economic system will be provided as innovative technologies are introduced into an increasing number of industries and areas, as well as the share of digital industries in the market increases. It should be noted that the government can also play a role in disclosing the potential growth in the productivity of enterprises, by attracting additional investments in digital skills, innovations and new business models (Ivanov et al., 2021; Zaporozhets et al., 2021).

The modern world is in the formation conditions of a radically different system, the digital economy, according to Jayashree et al., in which the main components are:

- digital infrastructure are the means that include a set for collecting, processing, storing information, as well as information technologies that ensure the organisation of effective entrepreneurial activities and effective business interactions with market entities;
- management processes formed by information means in the conditions of virtual market interactions;
- electronic services for both legislative and executive government;

- e-commerce which is currently the largest segment of the digital economy (Jayashree et al., 2021; Tanirbergenova et al., 2021; Kisiołek et al., 2022).

In this study, it can be also mentioned the fact that for modern scientific literature the concept of digital infrastructure is understudied, even though this definition has spread quite widely due to the active development and application of digital technologies and the expansion of their significance for social and economic systems. Therefore, according to Zhang et al. (2022) at this stage, the priority task is to study the essence and scientific content of the digital infrastructure concept.

In Malaysia, entrepreneurship and the government are active in the digitalisation industry. However, despite this, many companies are still at the initial stage of digital transformation. It is possible to identify a number of reasons for the low readiness level of Malaysian enterprises for digital transformation, such as: the lack of special skills in the industry for the introduction of advanced technologies and a specific organisational culture, outdated management approaches and the lack of up-to-date analytical electronic production data. Hang (2021) in his publication state that many Malaysian industries do not realise the opportunities that digitalisation provides them, they are not ready to invest in it and make the transformation in their own enterprises. Therefore, the problem of digitalisation accelerating of Malaysian business is of particular relevance.

Digital production management often means the transformation of existing management processes into their digital analogues to obtain certain effective effects. Xue et al. (2022) states that digitalisation tools make it possible to obtain objective data on production and use to the full artificial intelligence technologies for a qualitative increase in the productivity of an enterprise and retaining the effect obtained in the long term.

M. J. Ziółkowska (2021) is convinced that despite the fact that the digital transformation problems have become especially relevant for specialists only in recent years, the prospects for the transition to a digital economy were reflected in scientific works at the end of the last century. However, currently, the number of studies on the digital production management problems is still small. Most of these works are devoted only to the theory and some aspects of digital transformation, as well as practical problems at the global level. Often, they describe algorithms for modeling management processes and assessment of the transformation effectiveness. It should also be emphasised that due to the relatively low level of entry of artificial intelligence technologies into Malaysian business, there is a certain lack of scientific studies regarding the problems of the digitalisation effectiveness for Malaysian companies.

Rupeika-Apoga et al. (2022) talks about the reason for the high intensity of the application of new technologies in industrial enterprises, many of which make it possible to completely transform the management process, over the past decade, the concept of the Fourth Industrial Revolution has become widespread. It is associated with the introduction of cyber physical systems and is characterised by the concept of Industry 4.0. The main components in such a concept are

such components as the concept of big data analysis, Internet of things technologies, blockchain, deep learning and augmented reality.

Koumas et al. (2021) is convinced that all of this characterises virtual reality as an integral component of Industry 4.0, which makes it possible to increase the efficiency of interaction in robotic machines. Due to artificial intelligence technologies, a person can learn interactively and receive comprehensive support during production processes. The main point is that this eliminates the need for regular use of technical documentation on electronic or paper media. All of this has a beneficial effect on the production process efficiency.

J. Holmström (2020) in his publication says that digital production management plays a significant role in the transformation of Malaysia into a highly profitable country. Therefore, the prospects disclosure of the digital economy is the key to progress. Options for implementing of such transformations include such components as, improving the regulation of Internet technologies to correct business practices and human capital through the development of educational programs, improving the quality of public services, and reinvesting in the key economy areas. The digital economy has completely changed social life and provided new opportunities and challenges. Advanced technologies can make a significant contribution to achieving key sustainability purposes. Malaysian industries should take international cooperation to the next level while avoiding unintended risks.

5. CONCLUSIONS

Numerous issues related to determining the most effective digital technologies for modern production management require careful study to develop improved management methods that will radically change the outdated enterprise system during the period of complete digital transformation of all industries and areas. An important aspect of this issue is the definition of incentives for the digital technologies development in Malaysia, which is essential in terms of further studies to determine the level of influence of this area on the entire enterprise industry. It is possible to radically transform modern society in the near future due to the areas such as: the Internet of things, artificial intelligence, advanced technologies and digital transformation.

Based on the works of modern economist researchers, the digital transformation of the country's economy is defined not only as a key aspect of the development of the national economy and ensuring the state's competitiveness, but is also an undeniable requirement of modernity from the point of view of enterprise management. The use of digital technologies in the management of modern production ensures the reduction of individual costs and optimisation of management processes, allows the modelling of innovative business technologies and increases the level of resource efficiency. As an example, in the course of production management activities, a significant amount of information arises, which requires the creation of a digital infrastructure through the introduction of modernised digital tools to implement an effective systematisation of this data. Thus, thanks to digital transformation, every stage of management is improved, and production becomes modern, which favourably affects all business processes and the results of the enterprise.

The analysis of foreign experience in the transformation of enterprises shows the need to implement the following components: the use of cyber-physical systems in production and social life; maximum intensive implementation of network digital technologies at all stages of production and product delivery (cloud service and intelligent robotic technologies); implementation of analytical and numerical modelling tools; application of remote control of production; etc.

In the course of the study, the authors identified key features of the implementation of the policy of building an innovative economy in Malaysia, which is determined by the nature of the state economy: the absence of centres of fundamental scientific research, the involvement of both foreign companies and international training centres based on tax and non-tax benefits, the development of private and state entrepreneurship at the same time. The main difficulties in the digital transformation of Malaysian enterprises include a significant lack of technical specialists, insufficiently active implementation of digital technologies by most enterprises, a gap between the level of digitalisation of enterprises of different levels (small or medium enterprises and large companies), the lack of special skills in the field for the introduction of advanced technologies and specific organisational culture, outdated approaches to management and lack of up-to-date analytical electronic production data.

Having analysed the existing problems in the application and development trends of digital technologies in production management, caused by the insufficient development of this issue, it can be concluded that for the formation of modern high-tech industries, such stages as: the introduction of modern digital technologies in various areas of production, entrepreneurship will become necessary in general. Different industries are closely intertwined, problems of a specific nature affect the entire industry. That is why the actions of industrial workers should be consistent and planned. In other words, an integrated approach is needed in the development of new methods for digital production management. The process of implementing digital technologies in production management must be implemented comprehensively, that is, modern digital tools should be used in all management production processes, and not only in a certain production area. It is undeniably important to develop an effective strategy for the development of the enterprise, as well as to take into account the experience of competitors or enterprises of a related type of activity in order to minimise the common problems of digitalisation. Therefore, the actual task of the Malaysian enterprise system is to involve managers in the development of innovative technologies, the formation of a high level of productivity.

The materials of the article are of practical value and can be used in the development of modern methods of modern industrial production management in Malaysia. The prospects for further studies on management methods in the context of the efficient and competitive modern enterprises formation are due to the outdated economic and political system and the innovative potential of the modernised enterprise system. For specialists of all skill levels, the necessary action will be to form a unified management strategy that will improve existing business methods for the enterprise system in the context of globalisation.

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