

# MANAGING THE INTELLECTUAL POTENTIAL OF GLOBAL VALUE CHAINS IN THE CONTEXT OF DIGITALIZATION CHALLENGES

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**Abstract:** This article delves into the interrelationship among contemporary economic phenomena, namely global value chains, digitalization, and the management of intellectual potential. The paper scrutinizes and underscores the antecedents that led to the inception of the global value chains concept, and delineates an evolutionary diagram of this notion.

The aim of this paper is to examine the importance of global value chain challenges and their impact in the digitalization context. To achieve this goal, the Delphi method of collective examination is used in order to conduct a large-scale survey with the involvement of economists working in the global value chains field. The results of the study show that the factor “Lack of skills in the use of digital technologies” is the most influential, and the factor “Corporate culture” is the least influential. A statistical survey was carried out, involving a sample of sixty respondents who are experts in the field. Subsequently, a number of challenges were ranked based on the scores obtained through the Delphi collective examination methodology. The research confirms the pronounced significance of macro groups encompassing challenges to cyber security and the degree of digitalization among the company’s personnel.

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The novelty of this research lies in the proposed classification of the challenges of the global value chains in the digitalization context and conclusions obtained thanks to the collective expertise regarding the significance of the classified factors.

**Key words:** digitalization, global value chains, intellectual potential, challenges

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## Introduction

The concept of global value chains is one of the classical theories of economics that were developed in the post-crisis economy. The significant prerequisites for the emergence of this concept were the peculiarities of the transition period of the economy as a result of the processes of globalization and scientific and technological progress: some old trends and schools became irrelevant, there was a rethinking of the democratic states role in regulating the economy and ensuring market stability, and the development of information technologies initiated the modernization for a number of approaches at an interdisciplinary level and the strengthening of digitalization processes. Thanks to global value chains, countries with economies in transition are able to integrate into the world economy at lower costs.

## Literature Review

Michael Porter, in his 1980 work "Competition", first developed *the concept of global value chains (GVC)*, defining it as "the sequence of actions that companies take to create and deliver goods and services" (Porter, 1980). The stages, identified by Porter, were as follows: manufacturing, supply of components, logistics, marketing, distribution, and after-sales service. At the same time, an important aspect of the concept of global value chains was the idea of the possibility of modification and optimization of chain stages achieved by increasing technological efficiency, involving the latest methods of personnel management, and creating information or logistics infrastructure according to the needs of a specific market. For example, one of the modernized and more digitized GVC models includes the following *sequence of stages*: R&D, design, procurement, production, distribution, marketing, service.

To date, the challenge to the development of applied digitized tools for the optimization of global value chains is the insignificant structuring of intellectual potential within individual enterprises. The formalization and

preservation of intellectual potential in specialized databases can help automate a number of business processes in the formation of global value chains, including serving as a possible means of supporting decision-making.

As a result of adaptation to global economic, technological and social changes, the evolution of the development of global value chains has taken place. An important role in this evolution has been played by the introduction of new strategies, technologies, organizational models and interactions between the different participants in the value chain.

The initial GVC model, first introduced by Porter, is also commonly referred to as the "*linear chain*". A linear chain is based on traditional economic principles, where each stage of value creation is sequential and carried out within a specific organization. The general rules for creating a linear chain, if considered in the context of a digital model, have much in common with the classical cascade model of digital product development (Royce, 1970). The main rules for the functioning of the linear chain include clear coordination of each stage, optimization of processes with the main goal of reducing current costs, classic command hierarchy and interaction in production, control and evaluation of each stage.

The next stage of the GVC evolution became transitional in the international context, as significant limitations and shortcomings of the linear chain were evident, and at the same time globalization processes began to develop in geometric progression. The distribution of value-creating functions between different locations around the world, in order to ensure better efficiency and access to resources, was a simple and convenient solution to a number of economic problems at the time, and also contributed to the formation of strong economic ties between different markets and states.

With the increase in the number of globalization processes, it became necessary to improve the adaptability and flexibility of changes in the interaction of individual enterprises depending on the needs and market conditions. The concept of "*weak ties*" was introduced, which reflects less close but potentially more beneficial ties between people or organizations. While using weak ties, it is possible to gain access to new information, opportunities and resources, which is important for business development (Granovetter, 1973). "Weak ties", which is one of the leading ideas at this stage of global value chains, involves the exchange of ideas, knowledge and resources at the inter-societal, inter-industry and inter-organizational level, which in turn means the evolution of the interpretation of the importance of the term "intellectual potential", which in the previous stages took place only within a certain enterprise and was often neglected due to insufficient

formalization. The introduction of the network relations element into the model of global value chains, and thus, another modification of this model and, accordingly, the transition to a new stage, made it possible to solve a number of problems originating from the previous stages and develop such types of interaction between enterprises as horizontal and vertical integration, outsourcing and strategic alliances. In addition, at the "network" stage, the role diversity of the same agents took place, depending on specific needs and context. They can act as suppliers, consumers, partners with joint projects, etc. This encourages flexibility, innovation and co-development between network participants.

The development of the ideas of the "*network stage*" becomes a transition to the next stage, where there is a transition to heterogeneous economic relations. This type of economic relations within GVC only further deepens and generalizes the features of the previous type. Heterogeneous economic relations involve different types of entities, such as enterprises, government bodies, non-governmental organizations, international organizations, etc. These entities may have different goals, interests and level of influence (P.Gibbon, 2009). Despite their unequal position on a number of issues, entities try to establish various forms of interaction - from trade in goods and services to investments, financing, as well as the exchange of ideas, which is very difficult to regulate, because it again leads to the problem of the ambiguity of the concept of "intellectual potential". Heterogeneous economic relations occur in different economic, political, socio-cultural and institutional conditions. These conditions can be different legal systems, customs regimes, tariff barriers, political stability, the level of infrastructure development and other factors that affect the conditions of interaction. Such factors can significantly complicate the choice of interaction formats, but at the same time help to discover new exclusive forms of cooperation and organization of production. Depending on the specifics of establishing connections and a number of other criteria, the form of relations is chosen. For example, some relationships may be based on a market economy with an emphasis on free competition, while others may be based on government regulation and control. The key benefits of this stage, in the evolution of global value chains, are access to new markets, technology sharing, increased sales and expanding global presence. The disadvantage is the presence of a large number of unknown variables in the GVC environment and the variety of methods for interactions with the complexity of evaluating the choice of the best method. At this stage, the intellectual potential can be structured in the form of a large-scale database of subjects with all the

necessary information, and later, when creating an automated decision support system, this information will help determine the organization of cooperation.

From the stage of "*heterogeneous economic relations*", one can observe the transition to the stage of integration of technology and innovation, which is most often found at the peak of the computer revolution at the end of the 20th century. This stage is characterized by the automation of processes, the use of data analytics for decision-making and the introduction of new digital platforms for communication and information exchange. The role of intellectual potential has deepened and simultaneously acquired several meanings, which include: innovative ideas and knowledge of the GVC market, intellectual property of individual entities in the form of patents, accumulation of technological potential in the form of scientific methods and algorithms.

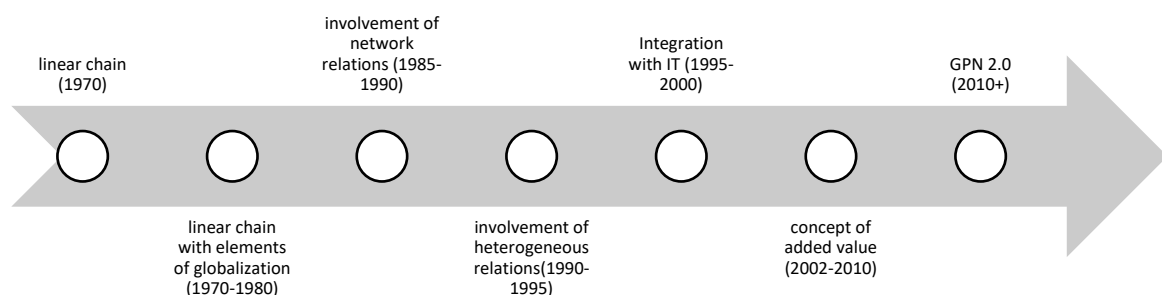
The next link in the evolution of GVC was the concept of creating added value in the organization of the chain. Added value is a concept used in economics to determine the difference between the value of input materials, components or services and the output value of the finished product or service created in the production process. The basic idea behind added value is that each stage of a production process or activity in an organization can add new value to the original materials or components. According to researchers, added value can be achieved by improving the quality of products or services, the uniqueness of offers to the client, as well as the use of an individual client-oriented approach, optimization of the supply chain, innovation and competent use of accumulated intellectual potential (Sturgeon, 2005).

Currently, the last link in the development of GVC is the concept of global production networks. The key difference between traditional Global Production Networks (GPN) and GPN 2.0 is the shift from a focus on discrete activities and linear flows to complex, data-driven ecosystem governance. Whereas GPN explores geographically dispersed production and distribution activities, GPN 2.0 examines power dynamics and value capture within digitally-enabled and platform-coordinated ecosystems. GPN 2.0 highlights the role of platforms and data-driven insight in allocating resources and governing decisions within global networks. It emphasizes how leading firms leverage their digital and data capabilities for greater network control and value capture - reshaping asymmetric relationships with dispersed suppliers and customers. GPN 2.0 is based on distributed production systems, where different stages of production are spread across different countries and regions depending on their competitive advantages. The main idea of GPN 2.0 is to attract network specialized suppliers and contractors from different

countries who have unique competencies and capabilities. In GPN 2.0, the majority of enterprises are focused on ensuring quality, innovation and speed of response to changes in market conditions. They are looking for cooperation with specialized partners who can provide high quality components, products or services, as well as develop new technologies and innovations. This allows businesses to focus on their core competencies and bring highly qualified resources from around the world to the network.

One of the features of GPN 2.0 is to manage the entire production network instead of individual links of the supply chain. This means that companies not only buy goods or services from their suppliers, but also actively cooperate with them, jointly plan production, coordinate deliveries and exchange information. This approach allows for greater efficiency and flexibility in supply chain management. An equally important aspect of GPN 2.0 is the active use of information technologies and means of communication to ensure fast and efficient exchange of data and information between various network participants. This provides an opportunity for businesses to collaborate virtually, where different teams and departments can work together regardless of their physical location. Thus, in this approach there is an integration of all the previous stages of the GVC development and the selection of their best features and achievements, of course, as a result of the steady progress of information technologies, the role of digitalization and intellectual capital only increases, generating both new opportunities and challenges.

Figure 1 shows the evolution of global value chain concepts as a timeline, which also shows the years of greatest adoption of a particular concept.



Source: study results

Figure 1. Evolution of concepts of global value chains

### Data and Methods

With significant informatization and technologization, as well as with the growth of information volumes, a number of challenges appear before the digitalization of intellectual potential management of global value chains.

Florian Butollo, in his work on the restructuring of digitalization assets in global value chains, considers that current problems in the field include the need to find alternative means due to the storage of large volumes of data and the cybersecurity measures organizing inadequacy to prevent information leakage.

Meanwhile, Indian scholar Karishma Banga highlights the problem of coordinated efforts across all links to clearly organize the infrastructure of the global value chain.

Other academics argue that rather than opting for backshoring, digital transformation (DT) is likely to foster the decentralization of progressively sophisticated tasks within organizations. Advanced manufacturing exhibits significant synergies in co-location with research and development (R&D). The production process demands close interactions with both product- and process-oriented R&D efforts.

First of all, the challenge group is closely related to all information and its storage and distribution, characterized by the need to maintain cyber security at a sufficient level at all times. Dependence on digital technologies creates new risks in global value chains related to cyber-attacks, data breaches and information misuse.

Key cybersecurity challenges in managing the intellectual potential of global value chains include:

- Cyber-attacks: Companies can face various types of cyber-attacks, such as hacker attacks, phishing, system breaches and others. These attacks can lead to the leakage of confidential information, damage to the company's reputation and loss of customer trust. To counter these attacks, it is necessary to establish strong security measures, use effective anti-virus programs, protect the network and system with firewalls and other protective means.

- Internal threats: Insiders, i.e. internal employees of the company, can be used to carry out cyber attacks or unauthorized access to confidential information. Effective cyber security should include controlling access to systems and information, monitoring employee actions, and regular cybersecurity training. The connection with the management of the intellectual potential of this challenge is difficult to trace directly, but it exists: after all, large volumes of data, characterized as the intellectual achievements of one or

another organization, may be at risk due to the irresponsibility of individual employees and the human factor of spreading secret information.

- Security of suppliers: Global value chains involve cooperation with numerous suppliers from different countries. This creates additional risks regarding information and data security, as providers may have their own vulnerabilities or insufficient security measures. It is important to conduct security assessments of vendors, including their cyber security and security policies, and require them to meet high security standards. Cooperation in the formation of global value chains contributes to the growth of the intellectual potential of enterprises or organizations that interact with each other, which means that the involvement of a significant number of third parties and insufficient protection of information will lead to the leakage of a large amount of important data at the international level.

- Adoption of new technologies: The rapid development of technologies such as artificial intelligence, the Internet of Things (IoT), cloud services and others offers many new opportunities for global value chains. However, these new technologies also bring new challenges to the field of cyber security. Inadequate security of new technologies can lead to vulnerabilities, system hacking or unauthorized access. When using new technologies, it is necessary to ensure a high level of cyber security and apply appropriate security measures.

- Regulatory requirements: Companies operating in global value chains must comply with various regulatory requirements regarding cybersecurity. Different countries and regions may have their own regulations and safety standards that must be taken into account. Ensuring compliance with regulatory requirements requires careful study of these requirements and development of compliance strategies.

The next major group of digitalization challenges in the management of the intellectual potential of GVC is the retraining of employees in connection with the emergence of new technologies. Any retraining for the moment should be organized using the latest information technologies, this is especially important in emergency situations thanks to the organization of distance learning. Undoubtedly, the requirements for compliance with the principles of transparency and equality of employees during training, encouraging them to retrain by involving elements of gamification, and building a convenient system of employee skills with an orientation to their strengths that they can develop are important.

Digitalizing the intellectual potential of GVC often faces such a group of challenges as the issues of integration and standardization. The use of different digital systems and platforms can create integration and



interoperability challenges between different participants in the global value chain. Standardization of processes, protocols and interfaces can facilitate harmonious functioning and cooperation between different companies. However, establishing standardization at the level of different enterprises with different corporate cultures belonging to different states with a different mentality is not an easy task. A possible variation of the solution is the internationally approved standards application for the digitalization of ideas in the process of the global value chain - including the use of BPMN and UML notations for modelling business processes, compliance with security policy rules, compliance with marketing standards, which include a number of ISO standards, in including a code of ethics for marketers. It is recommended to establish a certain set of international standards for each of the stages of GVC, and when forming the intellectual potential of ideas and innovations, to subject each of them to inspection and control in order to avoid violations of the rules.

The group of challenges related to legal aspects has a number of common features with the previous group, but the requirements for compliance and regulation of these aspects are even stricter. The use of digital technologies in global value chains requires compliance with legal norms and regulations related to data protection, privacy, copyright, ethics or legislation of the states of the interacting subjects.

Adopting digital technologies can require significant changes in organizational culture and work processes. Such implementation can cause resistance from employees and require active change management, communication and staff training, and often takes place in organizations with a conservative type of corporate culture, so it can be isolated in a separate group of challenges. It is worth noting that currently, global digitalization and the improvement of digital competences of the staff have made it possible to almost get rid of a large number of possible challenges for this group. On the other hand, everything depends on the level of requirements for improving the skills of employees - and with the increase of robotics, 3D printing, modelling tools and other technologies, the need for low-skilled specialists decreases, and the increase of intellectual potential becomes important, moreover, within the framework of its compliance with modern requirements - what was considered a technological breakthrough fifty years ago will no longer surprise anyone, but it is necessary to develop and deepen the latest competencies. This group of challenges has a lot in common with the group of challenges of retraining employees, but rather generalizes the problems of personnel management in setting up GVC today.

The use of digital technologies requires the availability of appropriate infrastructure, such as fast Internet, advanced communication tools and the availability of digital platforms. In some regions of the world, there may be

limitations or insufficient development of digital infrastructure, which can make it difficult to implement digital solutions in the global value chain. Challenges of this nature must be solved at the international level by involving international organizations, investors and volunteers in order to implement the most modern technologies even in the least economically developed states.

The last group of challenges is called the risks of cloud services. Using cloud-based services for data storage and processing can provide many benefits, but it also introduces data privacy and security risks. Businesses need to be careful when choosing and managing cloud services, ensuring the appropriate level of protection and control over their data. The following measures can help to avoid these risks:

- Choosing reliable cloud providers: Before choosing a cloud provider, you should carefully analyze its reputation, security standards, data protection measures and disaster recovery procedures. Businesses should consider certifications, such as ISO 27001, that confirm a cloud provider's compliance with security standards.

- Data encryption: It is important to encrypt data stored in the cloud to ensure its privacy. Encryption can be applied both at the client level and at the cloud service level. Using encryption mechanisms such as TLS (Transport Layer Security) or AES (Advanced Encryption Standard) can ensure that data is protected during transmission and storage.

- Access control: Enterprises must establish access control mechanisms to cloud resources and data. This may include the use of multi-level authentication, roles and access rights, access auditing and monitoring of user activity. Such measures will help prevent unauthorized access to data and hacking of accounts.

- Data backup and recovery: It is important to have a data backup and recovery strategy in place to ensure recovery in the event of data loss or corruption. Businesses should regularly back up their data and test its functionality. It is also a good idea to have a disaster recovery plan that includes recovery procedures and testing.

All of the listed measures are important for managing the intellectual potential of organizations, because they allow to prevent the destruction or damage of intellectual resources.

## **Analysis and Results**

Sixty selected experts in the field have analyzed data from seven groups of digitalization challenges in managing the intellectual potential of global value chains (alternatives) using the Delphi collective expertise

method and evaluated them according to the influence criteria. Evaluation is carried out using an automated window work program. Figure 2 illustrates the final stage of ranking the digitalization challenge groups. The decoding of the serial number of each group is presented below in Table 1.

1. x2	
2. x6	
3. x3	
4. x1	
5. x5	
6. x4	
7. x7	
	z1 (Influence)
► x1	5.102
x2	5.434
x3	5.129
x4	4.801
x5	4.973
x6	5.406
x7	4.696

*Figure 2. The final stage of the collective examination of digitalization challenges*

*Table 1.  
Decoding of the collective expertise*

Number	Decoding
X1	Infrastructure
X2	Lack of skills in the use of digital technologies
X3	Cybersecurity
X4	Cloud services
X5	Standardisation
X6	Legal and regulatory issues
X7	Corporate culture

While conducting this collective assessment, it can be concluded that the most significant group of digitalization challenges during the management of the intellectual potential of global value chains are risks associated with lack of skills in the use of digital technologies, and the least significant group of risks are risks associated with changes in corporate culture.

## Conclusions

The study proposes a classification of threats to global value chains in the context of digitalization and offers a systematic model for their development.

The study's findings lead to the conclusion of the need to develop an algorithm for mitigating the threat of a lack of skills in the use of digital technologies, while it is considered impractical to focus on the factor of corporate culture due to its insignificance. The following solutions are possible:

**Firstly**, it is essential that enterprises of various lines conduct extensive awareness-raising activities among employees regarding digitalization. However, it should be noted that these should not be courses at the level of acquiring computer literacy, as the level of specialists, especially in the field of global value chains, has significantly increased in recent years. The intellectual potential of global value chain enterprises should be able to work with application software packages for modelling and further digitalization of business processes, create simulation models in specialized environments, handle big data volumes, analyze information, visualize it, and use artificial intelligence to find solutions in nonlinear situations.

**Secondly**, the next most important risk factor is legal and regulatory issues. Therefore, employees must be aware of the current legislation regarding the digitalization of global value chains, and enterprise management should take the initiative to conduct specialized training and provide all the necessary information.

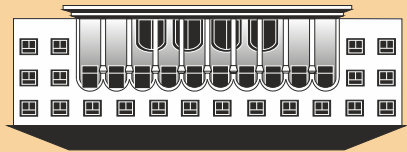
The above recommendations will reduce the significance of these risk factors and enable the development of innovative GVC management methods at a more efficient pace.

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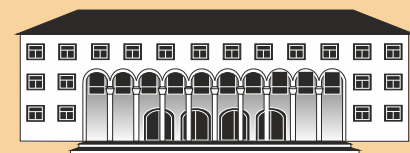
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