SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2025
ORGANIZATION AND MANAGEMENT SERIES NO. 233

POLISH SEAPORTS AND INNOVATION

Wojciech KOLASA

Uniwersytet Ekonomiczny w Krakowie; kolasaw@uek.krakow.pl, ORCID: 0009-0004-7349-0132

Purpose: The aim of this article was to show the significant impact of innovation on the competitiveness of seaports.
Design/mathodology/approach: The main research method used was the analysis of professional literature, both domestic and foreign.
Findings: The significant impact of innovation on the competitiveness of seaports was demonstrated. It showed that in recent years, seaports have undergone significant transformation, utilizing modern technologies and adapting to changing supply chains in the age of globalization.
Orginality/value: This article highlights current innovations implemented in Polish seaports. It also provides a basis for further research and analysis of the impact of various innovations on building the competitive advantage of individual seaports.
Keywords: innovations, transport infrastructure, seaport, modern technologies, digitalization.
Cathegory of the paper: Literature review, General review.

1. Introduction

Modern seaports are no longer merely physical locations where goods and passengers are transshipped, but are becoming modern and technologically advanced logistics systems. Modern ports combine transport, warehousing, information, and industrial elements. Recent years have seen a noticeable increase in competitiveness among ports located in the Baltic Sea region, and innovation is becoming a key element in building a competitive advantage. Polish seaports located in the Baltic Sea region compete with ports in Germany and Russia, among others. This competitive advantage not only allows the seaport to acquire new customers but also provides the opportunity to maintain business relationships with existing contractors. A seaport is not only a business entity but also a crucial element for the economic functioning of a country. In the current geopolitical situation, seaports also play a significant role in military matters.

2. Innovation and competitiveness of modern seaports

In the twenty-first century, alongside competitiveness, innovation is a crucial element. These two concepts are closely related. However, the literature offers varying definitions of the terms competitiveness and innovation. Because a business entity must implement innovations to be competitive in today's market, it must also be innovative. Simultaneously, implementing various types of innovations leads to an increase in its competitiveness. Therefore, it is difficult to separate innovation from competitiveness. This principle also applies to seaports.

The determinants of business innovation can be divided into two groups. The first are external conditions, and the second are internal factors. External conditions are institutional in nature and concern processes and phenomena that influence the global environment in which a given business entity operates. The external determinants of innovative activity depend on factors such as the functioning of markets, the degree of openness of the national economy, technological advancement, and membership in various international groupings or organizations. Internal factors influencing a given business's innovation performance are those stemming from its internal resources. These include economic, technological, human, and organizational factors. Depending on the business's resources in these internal factors, innovation activities can be shaped. In other words, an entity with the appropriate resources of these factors is able to create innovations, implement them, and build its competitiveness.

Various models of innovation creation within a company can be found in the literature. Among them are Roy Rothwell and Walter Zegweld's interactive model of "innovation creation" and the recently gaining popularity of the open innovation model. Roy Rothwell and Walter Zegweld's interactive model emphasizes that, in order to create innovations, a company should prioritize research and development (R&D), marketing, and production and service areas (Rothwell, Zegweld, 1985). In the open model, however, significant importance is placed on ensuring the flow of innovation between market entities. The idea is for an economic entity that has developed an innovation to share this idea with others, even competitors. This would enable faster knowledge dissemination and more effective use of ideas that have already been developed (Zorska, 2009). This type of approach would also reduce the costs associated with innovation activities, as it would not be necessary to develop similar or identical solutions in another economic entity. Therefore, acquiring knowledge about innovation and research results from outside is crucial (Oniszczuk-Jastrząbek, 2013).

According to scientific literature, innovation should be one of the key elements of the modern economy and the entities operating within it. This is because innovative entities increase their competitiveness and simultaneously contribute to the economic development of the region and the entire country. This, in turn, provides opportunities for building prosperity and civilizational progress.

Based on the literature on the subject, four basic types of innovation can be distinguished. Product, process, organizational, and marketing innovations (Oslo Manual, 2005). Innovations implemented in economic entities are, in turn, a derivative of trends emerging in the global economy. These trends, in turn, are linked to technological progress, social and political processes, and institutional influence. Therefore, innovation and innovativeness are processes deeply embedded in the environment in which the entity implementing the innovation operates.

3. Innovation trends

Currently, global innovation trends include: satellite applications, big data, clean technologies, the collaborative economy, smart factories, the Internet of Things, servitization, advanced materials, and sustainable raw material supply (Szymanowska, Dąbrowski, Klimek 2024).

Satellite applications, as tools based on technologies developed by the space industry, enable the improvement of numerous processes, including those related to logistics, supervision, and data transfer. They enable the introduction of innovative solutions in many sectors of the economy, including seaports, where issues related to the movement of goods and their proper security are particularly important. They enable, among other things, the control of devices used within the port and the monitoring of the entire logistics chain between the port and the customer. Satellite applications are associated with Industry 4.0, a new stage of the industrial revolution.

Another element related to innovation processes is big data. This concept refers to large data sets that require advanced IT technologies for their processing. Currently, the use of artificial intelligence in analytical processes based on big data is gaining importance. Artificial intelligence enables faster and more precise analysis of large data sets and the presentation of specific relationships, which enable optimal decision-making. Big data sets offer enormous analytical and predictive capabilities, but due to the enormous amount of data obtained from various sources, it is necessary to constantly develop IT tools that allow for the proper analysis of such large data sets. Big data comes from cameras, antennas, microphones, mobile devices, readers, wireless sensors, and other types of devices. Without the use of modern computer systems, analyzing such a large data set would be impossible.

Another element related to innovation is clean technologies, also known as low-emission technologies. Implementing low-emission solutions can result in reduced negative environmental impact or improved energy efficiency. Currently, low-emission trends are gaining popularity. On the one hand, applicable regulations mandate the use of technological solutions that reduce harmful emissions into the environment. On the other hand, these actions are, in a sense, forced upon them by potential contractors, who, when choosing a product or

service, often consider the manufacturer's approach to low-emissions. The situation is no different in seaports, where potential contractors are increasingly paying attention to how the port and entities operating within the broader port entity impact the natural environment. It's worth emphasizing that low-emissions can be divided into several areas. First, there are issues related to the use of renewable resources (e.g., energy from photovoltaic panels, wind turbines, or biofuels). Another area involves recycling and the management of used products and waste generated by seaport operations (e.g., the disposal of used machinery and equipment, which can be a source of valuable raw materials). Another element is the use of fuels. It is of significant importance for the operation of a seaport and the ships it serves. This includes both low-emission fuels (LNG) and renewable fuels (hydrogen). Furthermore, electrification, broadly defined, contributes to reducing emissions generated by a seaport. This refers to the replacement of combustion engines with electric motors (e.g., in machinery and equipment used within the port to transport goods and people). The use of heating, ventilation, and air conditioning systems characterized by low energy consumption and high energy efficiency is also crucial. All these activities contribute to building a positive image of the business entity in the eyes of stakeholders, and this is related to corporate social responsibility (CSR) policies (Szymanowska, Dąbrowski, Klimek, 2024).

Another important trend related to innovation among contemporary businesses is the collaborative economy. It should be emphasized that this trend is distinct from the sharing economy. The sharing economy is a subset of the collaborative economy, which is a broader concept. The collaborative economy involves engaging potential or current consumers in the production or service process. The goal is to engage recipients of a given good or service in the production process and incorporate their comments, expectations, preferences, ideas, and suggestions so that the final product or service better meets the expectations of future buyers. This concept is relatively new, having originated in the first decade of the 21st century. The collaborative economy also aims to build a bond between the producer/service provider and the future customer, creating a bond based on trust and cooperation (Jastrzębska, Legutko-Kous, 2017).

Another important trend related to innovation is the phenomenon known as smart factories. These facilities are almost entirely autonomous in terms of their operations. Such entities, which significantly utilize modern ICT tools, robotics, and intelligent technologies, are able to significantly reduce operating costs, significantly optimize processes within the facility, and contribute to increased efficiency. This approach opens up new opportunities, not only for factories, understood as manufacturing sites for specific products, but also for businesses whose functions include extensive logistics. Seaports are an example of such an entity, which must adequately utilize their transshipment, transport, and warehousing capabilities. The use of modern tools allows for increased efficiency and effectiveness and an improved position in an aggressive market. Furthermore, better utilization of available resources, including energy, contributes to reducing harmful emissions into the environment. The use of modern tools and

modern applications allows for better coordination of the entire logistics process within a seaport. This allows for shorter loading and unloading times and more efficient use of available cargo space. The development of modern technology and increasing digitization are providing new opportunities for creating increasingly better and more technologically advanced systems that can be used in complex logistics processes.

Another important innovation-related issue is the Internet of Things. The Internet of Things allows for the wireless (e.g., WiFi, Bluetooth, or NFC) or wired connection of various types of objects, thus creating a specific network. This network can include both large objects such as machines, devices, and means of transport, as well as small elements such as employee identification cards, RFID tags, thermometers, humidity sensors, cameras, mobile phones, and computers. The use of modern technologies allows for the collection and processing of data, which enables more efficient and easier management of individual logistics, organizational, and control processes. However, the use of the Internet of Things in seaports also enables the appropriate security of specific goods, monitoring of port space, more efficient communication with contractors, and better forecasting of emerging trends in the logistics industry. The Internet of Things is inextricably linked to the concepts of big data and blockchain (Malucha 2018).

Another emerging trend in the innovation landscape is servitization, also known as the digitalization of service services. It involves expanding existing services with a set of additional benefits that can be implemented through the use of modern communication channels. The internet, of course, plays a significant role in the digitalization of service services. It allows for the development of new opportunities for interaction between service providers and recipients. The digitalization of service services also plays a significant role in the operation of seaports, as it allows for the expansion of existing service offerings with modern and more convenient solutions. It enables better management of the entire logistics process between service users and service providers, i.e., the seaport. The servitization phenomenon is related to the concept of the servitization of the economy. The servitization of the economy refers to the concept of a three-sector economic structure, where the service sector is gaining importance, while the agricultural and industrial sectors are losing importance (Szymańska, 2015). While the concept of servitization of the economy is not new, the concept of digitalization of service services is a phenomenon that has been developing significantly recently, and this development is made possible by the development of the internet. The digitalization of service services offers new opportunities for building a competitive advantage for businesses. By creating appropriate and customer-friendly digital tools (e.g., applications or websites), it not only allows for the acquisition of new markets but also enables the creation of a secure bond between service providers and customers, which is crucial in today's economy.

Another important trend related to innovation is the use of advanced materials. This applies both to materials used in the construction of a broadly defined seaport and those used in vessels operated by seaports. The use of appropriate materials for the construction and equipment of

a seaport reduces carbon dioxide emissions, contributes to better thermal insulation, improves the durability of buildings and machinery, and reduces operating costs. The use of modern materials allows for weight reduction without compromising strength and durability. An example of such a material is carbon fiber, which is increasingly used in various types of machinery and equipment. Modern materials characterized by high levels of tightness, strength, and plasticity are also gaining importance, and are used in the production of various types of tanks and installations for the storage and transport of chemical substances with very small structures. Hydrogen is an example of such a chemical. At the same time, considering the development of hydrogen technologies and plans to use hydrogen as an energy fuel, seaports must be prepared to store this type of fuel. Health-related issues must also be considered. Using appropriate materials with antibacterial properties in the construction of railings and balustrades, for example, helps reduce the spread of harmful bacteria and germs.

Another trend emerging today within the innovative approach is the sustainable supply of raw materials, which is related to the circular economy. The circular economy aims to reduce the generation of waste that pollutes the natural environment by using it as a source of raw materials. The circular economy, therefore, involves reusing resources, thus reducing the generation of new waste or pollution. This approach is intended to contribute to sustainable development and reduce the negative impact of economic processes on the planet (Szczech-Pietkiewicz, Czerniak, 2024). A sustainable supply of raw materials, based on a circular economy, also offers the opportunity to achieve greater freedom and independence in the sourcing of raw materials, especially those considered critical. A greater emphasis on recycling allows for the reduction of imports of certain raw materials from countries and regions that do not guarantee stable and continuous supply. In this way, seaports can also build a strong and independent position in the global market, as they are less dependent on unreliable supplies. At the same time, by adopting a circular economy, they build a positive image of their operations in the eyes of potential and current contractors. This approach can be considered corporate social responsibility (CSR), which also translates into strengthening their position in a competitive market as an entity that cares not only about economic aspects but also those related to environmental protection.

4. Generations of seaports

Several classifications of seaport generations can be found in the literature. It should be emphasized that the divisions into individual generations of seaports are not sufficiently clear-cut, and it is sometimes difficult to assess and classify a given port into a specific generation of seaports. Available classifications of seaport generations are changing due to evolving

information technology and the rapid development of technology (Kaliszewski, 2017). Below is a classification of seaport generations covering six generations.

First-generation ports are classic conventional ports that perform a transport function by typically handling bulk cargo, usually in the form of one-off and simple transport operations. Fulfilling the transport function requires providing the port with appropriate structures and tools that allow for the handling of cargo and passenger transport (Kuźma, Szczepaniak). These ports were characteristic until the 1960s. Despite the generational development of seaports over the years, ports that can still be classified as first-generation ports operate in certain regions of the world. Due to the low cargo flows experienced in certain regions of the world, ports of this generation do not necessarily have to be considered obsolete or redundant. They continue to function and fulfill their essential role. First-generation ports include yacht harbors and fishing ports.

Second-generation ports were developed between the 1960s and 1980s. This was a time when seaports had to adapt to the rapid growth of maritime trade. One of the challenges seaports faced was the introduction of standardized containers for the transport of goods. The introduction of containers for the transport of various types of goods significantly improved and accelerated the entire logistics process related to loading and unloading. Furthermore, the use of standardized containers made it easier to transport them using various means of transport. The introduction of containers into the logistics process was a monumental change in the world of transport (Bartosiewicz, 2013). Second-generation ports were also called industrial ports. This name was associated with the fact that industrial areas were located within port areas or in their immediate vicinity. This provided industrial entities with easy access to the port and transport services. The industrial development of ports necessitated further investment in the transport infrastructure located within the port area and in increasing the transshipment capacity of the ports themselves. The process of port industrialization also resulted in the expansion of port facilities. This, in turn, meant that ports increasingly influenced the development of cities located nearby. Second-generation ports began to be perceived as important transport hubs, supporting not only maritime transport but also road, river, rail, and sometimes even air transport (Grzelakowski, Matczak, 2012).

Third-generation ports began to emerge in the early 1980s. These ports were characterized by extensive logistics capabilities and a steady increase in the volume of cargo handled. These ports became a crucial element of the logistics chain, and through their efficiency and effectiveness, they influenced the functioning of the entire extended supply chain. Third-generation ports continued to develop until roughly the end of the 20th century. It is also worth emphasizing that third-generation ports were no longer characterized by the rapid development of industrial functions as was the case with second-generation ports. This stemmed from difficulties in acquiring new land located near seaports for further industrial investments. In this way, third-generation ports are becoming a crucial element of developing

logistics systems. In turn, the industrial and transport functions are being increasingly emphasized towards the transport (transhipment) aspect (Christowa, 2005).

Fourth-generation ports are ports that originated at the turn of the 20th and 21st centuries. The dynamic development of technology, the advancement of digitalization, and increasing globalization have enabled the creation of fourth-generation ports. These ports are characterized by very high transshipment efficiency, which is associated with the use of modern technological and IT solutions (Paixao, Marlow, 2003). Fourth-generation ports are also referred to as network ports, as they constitute a significant element of an extensive chain of global logistics connections (logistics network). Furthermore, these ports are characterized by high-quality sustainable development management and the use of innovation and modern technologies. Terms such as Economy 4.0 and Logistics 4.0 are associated with fourth-generation ports. A fourth-generation port is a transshipment hub of supra-regional importance.

Fifth-generation ports are characterized by the use of cutting-edge technological solutions and a commitment to environmental protection. They also place a strong emphasis on customer satisfaction and building long-term business relationships. Fifth-generation ports have the capacity to handle the largest vessels, and through the use of advanced transshipment, transport, and IT systems, this process is efficient and effective. Currently, these are the highest and newest generation of seaports.

Sixth-generation ports. Scientific literature also refers to sixth-generation ports. This category refers to ports of the future, which will be possible after implementing cutting-edge technical and IT solutions. These ports will be characterized by a high degree of autonomy through the implementation of modern ICT solutions. In such a port, the process of transshipment and transport of goods will be largely automated. This will enable even more efficient and effective transshipment and transport operations within the seaport. The use of modern solutions will also reduce operating costs and contribute to better environmental protection. Artificial intelligence holds significant potential for the development of sixth-generation ports.

5. Examples of innovations used in Polish seaports

5.1. OPS System

The OPS (Onshore Power Supply) system provides power to ships moored at the port quay from land. This solution allows ships in port to turn off their onboard generators and use power supplied from the quay. This means that ships in port do not emit harmful substances resulting from the combustion of fuels needed to power the generators, and at the same time, they do not emit noise. This approach allows for better environmental protection and creates more friendly

conditions for both port employees and ship passengers. The OPS solution has already been implemented at the ports of Gdynia and Świnoujście. Documentation is currently being prepared to introduce this system at the port of Gdańsk. This innovative solution will improve the quality of services offered at Polish seaports and contribute to their increased international competitiveness (Gospodarkamorska.pl).

5.2. Sea area landing

A third deepwater terminal has been opened at the Port of Gdańsk, which can handle the largest container ships. This investment increased the transshipment capacity of the Port of Gdańsk and facilitated the handling of the largest cargo vessels. The construction of "artificial peninsulas" in the Baltic Sea created additional storage areas, while the new section of the outer port, extending into the Baltic Sea, created new coastlines. This investment strengthened the Port of Gdańsk's position among European cargo ports. Furthermore, modern cranes were installed at the newly opened container terminal, allowing for the loading and unloading of the largest container ships (Portgdańsk.pl).

5.3. Expansion of road and rail infrastructure at the Port of Gdańsk

Investments in road and rail infrastructure were carried out at the Port of Gdańsk to improve access to the transshipment terminals. The expansion and modernization of this infrastructure facilitated the transport of goods to, from, and within the port. Increased road and rail capacity allows for the transport of larger volumes of goods while maintaining appropriate safety and comfort requirements by reducing traffic congestion. The expansion of the rail network at the Port of Gdańsk has allowed for smoother freight train traffic and increased capacity, thus facilitating the easier delivery of goods to the port via rail. Furthermore, a railway siding was built within the port, allowing for easier loading and unloading of trains served there. This solution is significant because it allows for greater use of rail for freight transport, which is considered one of the most environmentally friendly modes of transport after water. Thanks to this investment, the Port of Gdańsk gains new transshipment capabilities and becomes more environmentally friendly (baltichub.com).

5.4. eBrama system

The eBrama system is a modern IT system implemented at the Baltic Hub container port. It enables faster and more efficient management of the logistics process at the Baltic Hub container terminal. The system consists of a mobile application installed on the mobile phone of the truck driver transporting container cargo, as well as RFID tags affixed to the truck's windows. Upon entering the container terminal, the truck driver receives information via the application about the specific location of the terminal where the truck should park. After positioning the truck in the designated spot, the driver confirms this via the application.

An automated crane then drives to the designated point and, using RFID tags located on the truck's cabin, identifies the vehicle and begins the container loading or unloading process. The eBrama system allows for more efficient and effective transshipment management, positively impacting the competitiveness and efficiency of the Port of Gdańsk. This is an example of innovation that leverages modern ICT technologies (baltichub.com).

5.5. Szczecin-Świnoujście fairway deepening

In 2022, the investment involving the deepening of the fairway connecting the ports of Szczecin and Świnoujście (approximately 62 km of the route) was completed. As a result of the completed work, the depth of the new deepened fairway is 12.5 m, allowing for a maximum draft of 11 m for vessels entering the port. Previously, the maximum draft was approximately 9 m. This investment allows larger cargo vessels to enter the Port of Szczecin, increasing the transshipment capacity and competitiveness of the Szczecin-Świnoujście port complex. As a result of the investment, in addition to deepening the fairway, the coastal slopes were also modernized, and the fairway itself was widened to 100 m. The dredged material resulted in the creation of two islands with a total area of approximately 370 hectares. These islands will be used, among other things, to create new habitats for local bird species. The completed investment not only provides new development opportunities for the entire Szczecin-Świnoujście port complex but also contributes to the protection of the natural environment (ums.gov.pl).

Acknowledgements

Publication financed by the Krakow University of Economics as part of the Conference Activity Support - WAK 2025 program.

References

1. *Baltichub.com.* Retrieved from: https://baltichub.com/dla-kierowcy/system-ebrama, 02.10.2025.
2. *Baltichub.com.* Retrieved from: https://baltichub.com/o-baltic-hub/specyfikacja-terminalu, 01.10.2025.
3. Bartosiewicz, A. (2013). Rozwój konteneryzacji na świecie od końca XIX w. do czasów współczesnych. *Studia z historii społeczno-gospodarczej XIX i XX wieku, tom XI.* Łódź: Wydawnictwo Uniwersytetu Łódzkiego, pp. 126-127.

4. Christowa, Cz. (2005) Podstawy budowania i funkcjonowania portowych centrów logistycznych. Zachodniopomorskie Centrum Logistyczne – Port Szczecin. *Studia Akademii Morskiej w Szczecinie, no. 45.* Szczecin: Wydawnictwo Naukowe Akademii Morskiej w Szczecinie, pp. 11-12.
5. *Gospodarkamorska.pl.* Retrieved from: https://www.gospodarkamorska.pl/wdrozenie-technologii-cold-ironing-w-porcie-gdansk-rozwoj-infrastruktury-przyjaznej-srodowisku-84730, 01.10.2025
6. Grzelakowski, A.S., Matczak, M. (2012) *Współczesne porty morskie. Funkcjonowanie i rozwój.* Gdynia: Wydawnictwo Akademii Morskiej w Gdyni, pp. 95-96.
7. Jastrzębska, E., Legutko-Kobus, P. (2017). Ekonomia współpracy – definicje, klasyfikacje i dobre praktyki. *Zarządzanie Publiczne, 4(40).* Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego, p. 458.
8. Kaliszewski, A. (2017). Porty piątej oraz szóstej generacji (5GP, 6GP) – ewolucja ekonomicznej i społecznej roli portów. *Studia i Materiały Instytutu Transportu i Handlu Morskiego, no. 14.* Gdańsk: Uniwersyteckie Czasopisma Naukowe Uniwersytetu Gdańskiego, p. 94.
9. Kuźma, L., Szczepaniak, T. (1971). *Porty Morskie. Gospodarka portowa w zarysie.* Gdańsk: Wydawnictwo Morskie, p. 16.
10. Malucha, M. (2018). Internet rzeczy – kontekst technologiczny i obszary zastosowań. *Studia i Prace WNEIZ US, 54/2.* Szczecin: Wydawnictwo Uniwersytetu Szczecińskiego, pp. 55-58.
11. Oniszczuk-Jastrząbek, A. (2013). *Przedsiębiorczość w budowaniu zdolności konkurencyjnej przedsiębiorstw*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego, p. 97.
12. Oslo Manual. *Guidelines for Collecting and Interpreting Technological Innovation Data, 3rd Edition.* Paris: OECD/Eurostat, pp. 18-19.
13. Paixao, A.C., Marlow, P.B. (2003). Fourth generation ports – a question of agility? *International Journal of Physical Distribution & Logistics Management, vol. 33(4),* pp. 355-376.
14. *Portgdansk.pl.* Retrieved from: https://www.portgdansk.pl/zrownowazony-rozwoj/inwestycje-i-rozwoj/, 01.10.2025.
15. Rothwell, R., Zegweld, W. (1985). *Industrialization and Technology.* Harlow: Longman, p. 50.
16. Szczech-Pietkiewicz, E., Czerniak, A. (2024). Gospodarka obiegu zamkniętego jako potencjał zrównoważonego rozwoju polskich przedsiębiorstw. *Studia i prace Kolegium Zarządzania i Finansów Zeszyty Naukowe, 197.* Warszawa: Szkoła Główna Handlowa w Warszawie, pp. 86-88.
17. Szymanowska, B., Dąbrowski, J., Klimek, H. (2024). *Innowacyjność portów morskich.* Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego, pp. 64-65, 69.

18. Szymańska, E. (2015). Serwicyzacja gospodarki jako źródło jej transformacji. *Optimum. Studia ekonomiczne, 1(73).* Białystok: Wydawnictwo Uniwersytetu w Białymstoku, pp. 99-102.
19. *ums.gov.pl.* Retrieved from: https://www.ums.gov.pl/600-zakonczenie-modernizacji-toru-wodnego-swinoujscie-szczecin, 02.10.2025.
20. Zorska, A. (2009). Ku globalizacji działalności innowacyjnej korporacji transnarodowych. In: O. Dębicka, A. Oniszczuk-Jastrząbek, T. Gutowski, J. Winiarski (eds.), *Przedsiębiorstwa w otoczeniu globalnym. Rozwój w warunkach spowolnienia gospodarczego* (p. 64). Gdańsk: Fundacja Rozwoju Uniwersytetu Gdańskiego.