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Northern Sea Route e-platforms: tools for competitive development

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Purpose: The current study purpose is preparation of proposals for the creation of digital services platforms, which could be provided on the Northern Sea Route as an international maritime transport corridor, on the basis of an existing maritime container industry e-platforms analysis, as well as on the basis of the transport market participants requirements for the composition and characteristics of services.

Methodology: The problem is considered in terms of the Enterprise Architecture approach. This study uses TOGAF and the Capability Driven Approach (CDA), a modern approach to the information systems development. These approaches help in analyzing the peculiarities of global e-platforms from the perspective of aggregating the enterprise architecture components into a business capability and provide foundation for the suggested tools determination.

Findings: Conducted studies suggest that the digital business ecosystems development is now widespread in the maritime container shipping industry, and e-platforms are an effective tool to ensure their performance. With the help of EA and CDA, it is possible to formulate proposals for e-platforms, based on the synthesis of transport market participants requirements.

Originality: The NSR development as international transport corridor along with benefits at the same time is controversial for carriers for a number of reasons, including the need of the NSR competitiveness increase by providing service at the level usual for carriers. The results of this paper create a foundation for further researches of digital services development in Arctic maritime logistics.

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1 Introduction

Nowadays the existing economic situation and political will of interested parties create steady prerequisites of the Northern Sea Route (NSR) development as international transport (including transit) corridor. In the future, until 2030, it is expected on this direction the cargo flows increase not only for companies, operating in the Arctic, but also maritime container transportation volume growth from China to Europe. Along with benefits such as significantly reducing cargo delivery times, reducing geopolitical risks, providing an alternative to transportation across the Suez Canal, the Northern Sea Route project at the same time is controversial for carriers for a number of reasons.

The first reason is the economic efficiency of transit transportation in difficult Arctic conditions. It is well known that NSR winter navigation is impossible without the participation of an atomic ice-breaker fleet, which significantly increases the transit transportation costs in the Arctic, and modern ships designed for the Arctic year-round operation are very expensive. Despite of the Government of the Russian Federation readiness to subsidize carrier companies on this route, the issue of transit transport organization efficiency, interaction of ice-breakers and transport fleet, terminals and other transport process participants remains open.

The second reason is the lack of multimodal transport infrastructure in the Arctic, the need to develop economic sectors and related modes of transport which provide cargo traffic in the Northern Sea Route.

The third reason is the need of the Northern Sea Route competitiveness increase by providing service at the level usual for carriers. Currently, the

maritime container transport industry participants represent increased demands for the cargo transportation process transparency, container processing time reduction due to information exchange efficiency improvement between counterparties, possibility of multimodal transportation electronic processing.

The current study purpose is preparation of proposals for the creation of digital services platforms, which could be provided on the Northern Sea Route, on the basis of an existing maritime container industry electronic platforms analysis, as well as on the basis of the transport market participants requirements for the composition and characteristics of services provided along the Northern Sea Route as an international maritime transport corridor.

2 Method

Digital business ecosystems are currently becoming a modern way of cooperation and development in various sectors of economy. E-platforms are effective means of creating such digital business ecosystems and ensuring their functioning. This term first appeared in EU documents and referred the fact that the convergence of networks and information technologies forms the basis for growth and development of the economy. The rapid development of the Internet and information technology gave way to the creation of many digital business ecosystems, the largest ones being Google, Amazon, Facebook and Apple. There are many different definitions of digital platforms, but most authors define the digital platform as a system of formal and informal rules and algorithms for network user interaction, based on various architectural standards of software and hardware, which are used for storing, analyzing and transmitting data about the participants of the interaction (Styrin et al., 2019)

Today, electronic platforms are actively being introduced in the maritime container shipping industry. They perform various business functions and support the interaction of participants in the business ecosystems. The maritime environment is composed by electronic systems and services that manage various incoming and outgoing information and data through collaborative and automated processes and services (Ducruet and Zaidi, 2012). The platforms used in the industry now can be divided into three large groups by their role in the process of participants interaction in the business ecosystems:

- 1) E-platforms built by commercial ports. Thus, (Dellios and Polemi, 2012) describe Maritime Community Cloud platforms which support such business processes as ship and cargo management; intra-port communication; provision of information to regulatory authorities, transport services, healthcare organizations and other parties; ground container logistics, security services and information integrity services.
- 2) E-platforms built by public authorities. In order to facilitate the international trade procedures and coordinate the control carried out by the competent bodies of commercial and technical supervision, the governments introduce Single Window facility in their countries. Managed centrally by a leading agency, the Single Window provides public authorities with the opportunity to access information or actually receive information that is relevant for performing their tasks. Public agencies can coordinate their control actions while importers and exporters can submit standardized electronic data via a single entry point, in order to comply with all the regulatory requirements related to import, export and transit (Maydanova and Ilin, 2018).
- 3) E-platforms built by largest players of maritime container shipping industry. Keeping in mind the business capability of transparency and flexibility of the supply chain process, industry participants build various e-platforms thus aiming to ensure the functioning of the digital business ecosystem. The largest players that create such platforms are global forwarding companies, digital freight forwarders (that have just emerged on the market) and container shipping lines (Druz et al., 2018; Elbert et al., 2017; Feibert et al., 2017; Fruth and Teuteberg, 2017; Lam and Zhang, 2019; Zaborovsky et al., 2018).

For analysis of an existing maritime container industry electronic platforms and preparation of proposals for the creation of digital services platforms, which could be provided on the Northern Sea Route, the problem is considered in terms of the Enterprise Architecture approach, a concept of enterprise management that has been actively developed over the past 30 years by recognized management institutions and is now widely applied in practice. (Lankhorst, 2017) gave the following definition to this concept: “[EA] is a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise’s organization structure, business processes, information systems, and infrastructure”. Currently, there are several well-known approaches to EA. These approaches rely on different viewpoints on EA and modeling techniques associated with them. According to recent studies (Aldea, 2017), the most commonly used approaches are The Open Group Architecture Framework (TOGAF), Zachman Framework, Gartner Enterprise Architecture Framework, Federal Enterprise Architecture Framework (FEAF), Department of Defense Architecture Framework (DoDAF).

This study uses TOGAF and the Capability Driven Approach (CDA), a modern approach to the information systems development. These approaches help in analyzing the e-platforms from the perspective of aggregating the enterprise architecture components into a business capability and provide foundation for the suggested tools determination.

Business capability is a special ability or power that a business can possess or exchange in order to achieve a specific goal or result. A business capability can be defined by a description of what needs to be done with some de-

tails added. A further, detailed definition of the capability requires an understanding of how this can be achieved by combining such supporting components as roles, processes, information, and tools. Business capability is determined with the aim of lasting as long as possible, while the content of the components is subject to frequent changes. The implementation of a business capability also relies on a set of tools, or resources and assets, such as tangible assets (equipment) and intangible assets (available funds, IT systems, intellectual property) (Sandkuhl, 2018). For the analysis of an existing maritime container industry electronic platforms, as well as for the composition and characteristics of services provided along the Northern Sea Route as an international maritime transport corridor approaches and methods that can classify the impact of EA components on business capabilities of companies are required.

3 Results

The NSR as an international maritime transport corridor besides advantages of time saving cargo delivery and carrier companies subsidizing need to comply the advanced competition requirements. Currently, new establishment in management thinking has been the realization that individual enterprises no longer compete as self-contained entities, but rather as supply chains. Christopher states that companies enter "an era of "online competition," where prizes will go to those organizations that can better structure, coordinate and manage relationships with their partners in a network committed to ensuring excellent value in the final market. Supply chain management aims to provide more cost-effective end-customer satisfaction by integrating buyer/supplier processes. This integration is generally achieved through greater transparency of client needs through information sharing, as well as through the creation of seamless processes that link the identification of physical replenishment needs to a "just-in-time" response" (Christopher, 2005). As mentioned above, the digital business ecosystems development is now wide-spread in the maritime container shipping industry, and e-platforms are an effective tool to ensure their performance. Table 1 presents the TOGAF-based analysis and a classification of the existent e-platforms in maritime container shipping industry. Digital platforms on the basis of such supporting components as roles, processes, information, and tools support different business capabilities of companies - industry participants.

Thus, Maritime Community Cloud e-platforms support business capability of cross-border trustworthy e-services to all commercial ports and their users in a cost-effective way; Single Window e-platforms perform submission

of a standardized information and documents with a single-entry point to fulfill all regulatory requirements; business ecosystem e-platforms ensure supply chain transparency and agility and support e-commerce capability. In accordance with the development plan, the NSR will have at least two hub ports and business capability of cross-border trustworthy e-services to ports and their users need to be supported by digital platforms, developed either port community, either state body. Currently such digital platforms are not introduced in the Russian Federation as all ports of the RF are so named "out-ports", but not hub ports and their cargo handling volume is substantially lower. In case of the NSR hub ports construction, the need of Maritime Community Cloud e-platforms development will increase significantly. Single Window introduction is the world-wide initiative supported by The United Nations Network of Experts for Paperless Trade and Transport in Asia and the Pacific (UNNEXt) in cooperation with the Economic and Social Commission for Asia and the Pacific, United Nations Economic Commission for Europe, World Customs Organization and national governments and state bodies. With their concerted efforts the experience of Single Window creation was outlined, there were determined stages and foundations of the creation at the national and regional level. There were qualified five main stages of the national Single Window creation. Maydanova and Ilin propose that "they could be used as a basis for the long-term strategic plan for the implementation of a national Single Window and represent at the fourth level an integrated national logistics platform interlinking the administrations, companies and the service sectors to better manage the entire chain of import-export operations and on fifth level interconnection and integration of national single windows into a bi-lateral

or regional cross-border e-information exchange platform" (Maydanova and Ilin, 2018). Currently national Single Window is not introduced in the Russian Federation.

Brandenburg states that "the emerging competitive paradigm of today's complex global markets is that path to sustainable advantage lies through managing the complex web of relationships that connects suppliers and customers in a cost-effective, value-added chain. In connection with these changes, the role of transparency and flexibility of the supply chain is increasing and the continuous interaction of participants in the business ecosystem becomes a must" (Brandenburg, 2013). Keeping in mind the business capability of the supply chain process transparency and flexibility, industry participants build various e-platforms thus aiming to ensure the functioning of the digital business ecosystem. In case of the Russian container operator creation for international transportation along the NSR, e-platform supporting digital business ecosystem of the NSR should be developed. As was mentioned above, the implementation of a business capability relies on a set of tools: tangible and intangible assets. A variety of modern technologies are used to operate e-platforms in maritime container shipping industry, such as Cloud Computing, Electronic Data Interchange, the Internet of Things, Big Data, Global Positioning System (GPS), robotic-aided systems, cyber-physical systems, block-chain, radio frequency identification (RFID) tags, and sensors. All these technologies need to be introduced for the NSR digital platforms successful development. It is appropriate to devote special attention to such supporting component of business capability as information : modern digital platforms in maritime

container shipping industry support Business-To-Business (B2B), Business-To-Government (B2G), Government-To-Government (G2G) data exchange at the local, regional, national and global levels. The NSR e-platforms shall maintain such data exchange with using of various interfaces for interaction.

Table 1: Maritime container shipping industry e-platforms classification

Capability	Cross-border trustworthy e-services to all commercial ports and their users in a cost-effective way	Submission of a standardized information and documents with a single-entry point to fulfill all regulatory requirements	Supply chain transparency and agility / E-commerce
Roles	Maritime Community Cloud	Single Window	Business ecosystem
Business processes	Vessel & Cargo Management Inland Logistics Communication at Port Level Integration Services Security Services	Obtaining necessary permits and clearance related to import, export or transit-related requirements Obtaining international trade-related data and statistics in a comprehensive and timely manner	Booking placement Cargo tracking Rate analytics Procurement Supply-chain control Financing services Marketplace
Information	B2B, B2G Information Exchange on local / national / regional level	G2G, B2G Information Exchange on local / national / regional level	B2B Information Exchange on local / national / global level
Tools	Cloud Computing, EDI, Big Data, Robotics, IoT, RFID, sensors, cyber-physical systems, GPS, Blockchain	Cloud Computing, EDI, Big Data, Robotics	Cloud Computing, EDI, Big Data, Blockchain, IoT, RFID, GPS, sensors, cyber-physical systems, Robotics

4 Discussion and Recommendations

Thus, development of the Northern Sea Route as an international maritime transport corridor requires not only fleet and port construction, infrastructure development and organizational agents appointment, but the development of information and communication technologies as well, including e-platforms implementation. Such e-platforms will bring substantial competitive advantage to the Northern Sea Route and will provide service at the level usual for carriers.

Some discussion points could be determined at this:

- 1) Digital platforms will not be able provide services of the physical infrastructure, while developed the NSR physical infrastructure could work without any digital platforms. On this reasoning could be the answer that currently digital platforms become a substantial tool in competition between maritime container shipping industry companies allowing direct communication with customers. Such communication will help to increase quantity of shippers and at the end, profitability of the NSR shipments.
- 2) The NSR shippers will have advantage in timing and cost compensation and will not care about communications and supply chain transparency. This reasoning could be answered that usual logistic scorecard is not only time and cost, but service quality and relationships as well. Digital platforms will provide desired service quality and relationships, and cost compensation to shippers is very expensive approach for the NSR progress. Organizing the NSR services on the level usual for carriers will support to increase economic effect of a new international maritime transport corridor launching.

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