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Factors Affecting Container Seaport Competitiveness: Case Study on Port of Rijeka

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Abstract: In this research, the authors aimed to investigate the factors affecting the competitiveness of container seaports and apply the research results to the case study of the Port of Rijeka. The previous related research on the topic of the Port of Rijeka is valuable, however, the seaport competitiveness factors were not elaborated in detail, which also represents a research gap. As a first step, the authors identified the competitiveness factors influencing container seaports, using the literature review method. Further, the authors conducted the case study of the Port of Rijeka, using the following identified competitiveness factors: the port's geographical location, feeder connection, and maritime connectivity, infrastructure and superstructure of the container terminal, berth length, depth of the port and port area characteristics, road and railway infrastructure, port reputation, costs, customs procedure efficiency, and ICT systems. Finally, the authors propose measures to improve the competitiveness of the Port of Rijeka. The presented case study could be used as a reference point for similar container seaports, which are aware of their limited resources, but need to increase their efficiency and competitiveness.

Keywords: container shipping; seaport competitiveness; competitiveness factors; Port of Rijeka; case study

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1. Introduction

A seaport may be defined as a logistic and industrial node accommodating seagoing vessels and characterized by a functional and spatial clustering of cargo transport, storage, and transformation processes linked to global supply chains [1]. Seaports must adapt constantly to contemporary business conditions to remain competitive in the global market [2]. Seaport competitiveness is not a well-defined concept due to its complexity, and the nature and characteristics of competition depend upon the type of port involved and the commodity (e.g., containers, as in this research, etc.) [3]. Seaport performance and competitiveness have evolved due to, e.g., the existence of new ports with the latest technology, or because incumbent ports try to increase their efficiency to compete [4]. Seaports not only compete with their neighbors but also compete with other ports located in the wider region [5].

The majority of research dealing with seaport competitiveness has been focused on a specific seaport or group of seaports such as: [6–9]. For example, Pietrzak et al. [6] focused on the seaports in Zachodniopomorskie Voivodeship in Poland, and concluded that a connection of seaport with the national rail network may represent an important factor for the seaport competitiveness. Abbes [7] identified the key factors for African port competitiveness such as costs and customs procedure efficiency. Yeo et al. [10] identified and evaluated the competitiveness of major ports in Korea and China. Yeo [11] focused on Asian container terminals and identified factors that influence seaport competitiveness such as operating capacity, costs, connectivity, etc. In other words, to understand the complex issues related to seaport competitiveness, it was necessary to closely examine the data within the specific focus [12].

International trade is primarily handled by ships and containers [13]. Containerization has led to reduced transport costs and contributed significantly to the global supply chain [14]. Over the years, container ships have increased in capacity [15]. To adopt this trend, not only container terminal operators but also supply chain operators should be able to improve the efficiency of business processes at container terminals [16]. Due to the increasing importance of containerization and container transport, and the fact that the preliminary research has shown that most of the existing research on seaport competitiveness is focused on container seaports or container terminals within larger seaports, the authors have decided to focus on the research on container seaport competitiveness. The competitiveness of a container terminal is its ability to offer and sell services more attractive than those of its domestic and foreign competitors [17]. The analysis of previous publications has shown that research dealing with container seaport competitiveness factors (especially in European seaports) is scarce.

For the case study in this research, the authors have chosen the Port of Rijeka, Croatia, with a focus on container terminals that operate within the stated seaport. The Port of Rijeka is the largest and the most important seaport in the Republic of Croatia. The importance of container terminals is increasingly recognized by the Port of Rijeka Authority and other relevant stakeholders. In this respect, various projects are being launched to upgrade the aforementioned terminals [18,19], and consequently increase container traffic in the Port of Rijeka.

The previous related research on the topic of the Port of Rijeka is valuable, however, the seaport competitiveness factors are not in detail elaborated, which also represents a research gap. For example, Petrlić A. et al. made a comparison between the Port of Rijeka and the Port of Koper (considering the container business), and took into account only five main factors: container terminal equipment, number of liner services, transport network, and port tariffs, infrastructure investments and the number of implemented quality management systems [20]. Jurjević et al. [21] determined which of the three North Adriatic seaports (ports of Trieste, Koper, and Rijeka) is the most competitive transit seaport, taking into consideration multiple types of cargo. On the other hand, this research will focus only on the container terminal of the Port of Rijeka. Furthermore, Naletina et al. [22] analyzed the financial statements of the Port of Rijeka, taking into account safety indicators (liquidity ratios and leverage ratios) and activity ratios. They concluded that Croatian membership in European Union had a positive effect on the competitiveness of Port of Rijeka. However, the competitiveness of the Port of Rijeka needs to be analyzed in more detail, considering various factors.

The research aimed to analyze the factors affecting the competitiveness of container seaports through the literature review and to apply the research results to the Port of Rijeka. Taking into account the specifics of the Port of Rijeka, additional research was undertaken through the websites of the stakeholders operating in the Port of Rijeka or through the consultations with numerous Port of Rijeka stakeholders (commercial and administrative), mainly decision-makers who are directly or indirectly involved in planning, execution, and oversight of port development initiatives. The following research questions are addressed:

1. Does the Port of Rijeka have the prerequisites to become a competent seaport?
2. What does the Port of Rijeka have to improve in order to become competitive?

Considering the advantages and shortcomings of the Port of Rijeka, the authors will propose measures to improve the competitiveness of the aforementioned seaport. The case study is based on the identified container seaport competitiveness factors from scientific research.

2. Methodology

In order to archive the research goal, the authors established the methodological approach presented in Figure 1.

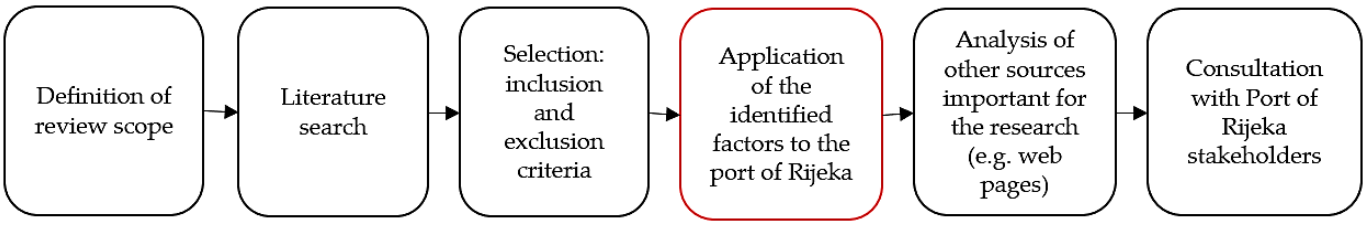

Figure 1. Research steps.

To define the container seaport (or container terminal) competitiveness factors, the authors conducted a literature review between April and June 2022. The search was carried out using the research database Web of Science. The authors have focused on two keywords: "seaport competitiveness" and "port competitiveness". The search was performed to determine whether the publications contain at least one of the keywords in the Topic or Title. The authors have limited the search to the following categories: Transportation and Transport Science Technology. Articles that were not written in the English language were excluded.

Furthermore, due to the lack of literature on container seaport competitiveness factors, and to enhance the identification and extraction of adequate literature, the authors have broadened the scope of research and included the papers dealing with the competitiveness of container ports, container terminals, and the competitiveness of ports in general. The identified container seaport competitiveness factors from the literature review served as the basis for a case study that will focus on container terminals in the Port of Rijeka.

For the case study, the authors used scientific papers dealing with the Port of Rijeka, as well as official websites of the stakeholders operating in the Port of Rijeka (e.g., Port of Rijeka Authority, terminal operators, etc.).

In addition, considering that some needed data were not available on official websites, and to obtain more detailed information, the authors consulted with numerous Port of Rijeka stakeholders (commercial and administrative), mainly decision-makers who are directly or indirectly involved in planning, execution, and oversight of port development initiatives. For example, ICT systems were identified as one of the seaport competitiveness factors, and it was necessary to contact the decision makers directly or indirectly involved in planning, execution, and oversight of digital transformation initiatives in the Port of Rijeka, in order to find out which projects are still ongoing or planned. Similarly, research was also carried out for other factors (if no information was available).

3. Results

In this section, the authors first identified the factors influencing the competitiveness of container seaports, and then conducted a case study based on the identified factors.

3.1. Literature Review

As already mentioned, container seaport competitiveness has been analyzed from different aspects, considering different seaports and their characteristics. Table 1 shows the container seaport competitiveness factors identified in the literature review.

Table 1. Container Seaport Competitiveness Factors.

Factors	Sources
Port geographical location	[6,17,23–28]
Berth length	[6,10]
Quality of port infrastructure and superstructure	[6,7,10,11,17,23–27,29]

Table 1. *Cont.*

Factors	Sources
Access to the road and the railway infrastructure at the port hinterland (hinterland proximity and connectivity), and connection with inland waterways	[6,9,11,17,23,25,26,28–30]
Feeder connection	[27]
Costs (including handling and inland costs, port fees)	[7,8,17,23–30]
Customs procedure efficiency	[7,17]
Operational efficiency (e.g., ship turnaroundtime, ship waiting times due to congestion, etc.)	[8,17,23,28,29]
Port service quality (prompt response, 24 h/seven days a week service, etc.)	[11,17,23–30]
Availability (number of berths, port congestion)	[10,17,27–30]
Maritime connectivity (the efficiency of shipping transport networks, e.g., number and variety of served destinations, logistics cost, etc.)	[7,17,23,29,30]
Depth of the port	[6,10,17,23,25,28,30]
Port area characteristics (the extension of the entire port area, the quality of terminal layouts and common spaces, as well as its appropriateness with respect to the needs of port users)	[6,23,25]
The cooperation between terminals	[31]
Port reputation	[17,24,25,27,28]
ICT systems (e.g., Port Community System)	[10,17,25,30,32,33]

Munim and Saeed [29] investigated how to port competitiveness research has evolved during the last two decades, using bibliometric citation analysis tools and techniques. They have identified seven underlying research streams in port competitiveness research: port competition, port efficiency, institutional transformation, port pricing, port embeddedness, port choice, and port cooperation. According to Abbes [7], the key factors for African port competitiveness are costs (including handling and inland costs) and customs procedure efficiency. Pires da Cruz and de Matos Ferreira [8] evaluated the competitiveness of Iberian seaports through efficiency using an alternative Data Envelopment Analysis approach. According to their research, seaport efficiency is not necessarily influenced by its cargo throughput.

To verify whether the collaboration through the Port Community System (PCS) positively affects the port competitiveness, Carlan et al. [32] conducted an in-depth literature review where interviews with experts of PCS were carried out, and developed a comprehensive framework to quantify the costs and benefits. Next, a case study for the Antwerp PCS was drawn up to develop a discussion regarding the costs and the extra benefits that port stakeholders incur when using a module of a PCS. The case analysis suggested that there is a positive cost-benefit balance for every stakeholder adhering to a PCS. Lee et al. [33] investigated how digital transformation of the container port can influence customer satisfaction and port competitiveness. For that purpose, the authors collected the data from the container shipping lines calling at the ports of Pusan and Incheon. They concluded that digital transformation affects customer satisfaction and port competitiveness through the adoption of the digital workplace, customer relationship management, and security, implying that container ports should make every effort to focus on digital transformation in these critical areas.

Yeo et al. [30] identified the following seaport competitiveness factors: prompt response, 24 h 7 days a week service, zero waiting for time service, etc. For empirical analysis, container ports located in Northeast Asia, known to exhibit severe port competition, were

selected. Yeo [11] analyzed the factors affecting the competitiveness of Asian container terminals by including factors such as operating capacity, convenient facilities, electronic document handling capacity, and connectivity to the hinterland. He concluded that those factors have a non-negligible role in the competitiveness of container terminals.

Salleh N. H. M. et al. [34] claimed that seaport inefficiencies have caused hindrances to the seaport operations, especially on operational disruption which eventually contributes to high-cost expenses, unnecessary waste and environmental pollution, and capital losses. Therefore, they proposed a Lean, Agile, Resilience, and Green performance model as a mechanism to curb these issues and improve the competitiveness of seaports.

It is possible to conclude that the quality of port infrastructure and superstructure, access to the road and the railway infrastructure at the port hinterland, costs, and port service quality as container seaport competitiveness factors are mentioned by most of the authors. However, due to the emergence of new digital technologies, the authors increasingly recognize the importance of the digitalization of business processes in seaports, as it improves the cooperation between stakeholders and service quality.

Table 2 shows the papers that had a focus on a particular seaport, group of seaports, a particular geographical area, etc. Literature review papers [23,27,29] are not included in this table since they only provide an overview of what was analyzed so far.

Table 2. The focus of identified resources.

Focus	Sources
Seaports in Zachodniopomorskie Voivodeship, Poland (Szczecin, Świnoujście, and Police)	[6]
North and West African seaports	[7]
Iberian seaports (Spain and Portugal)	[8]
Malaysian seaports	[9]
The Antwerp Port Community (Belgium)	[32]
Major Korean hub seaports—Busan, Incheon, and Gwangyang—serving the Asia–Pacific market	[25]
Korean seaports, particularly Busan	[26]
The seaports of Pusan and Incheon (South Korea)	[33]
The Port of Colombo, Sri Lanka	[31]
Northeast Asian container seaports	[30]
Asian container terminals	[11]
Major seaports in Korea and China	[10]
Busan Port (Korea), the port of Los Angeles/Long Beach (US), port of Le Havre (France), Port of Inchon (Korea), Port of Chennai (India), Port of Mayaqueez (Puerto Rico), Port of Melbourne (Australia), and Port of New York/New Jersey (US)	[24]
The seaports in the Hamburg (Germany)–Le Havre (France) range	[28]
Maritime container terminals in Asia, Europe, Africa, Australia, North America, and South America	[17]

The focus of the majority of research dealing with this topic is on a specific seaport or group of seaports.

3.2. Case Study: Factors Influencing the Competitiveness of the Port of Rijeka

After analyzing the literature, the identified competitiveness factors were grouped as shown in Figure 2, and as such will be used in the case study.

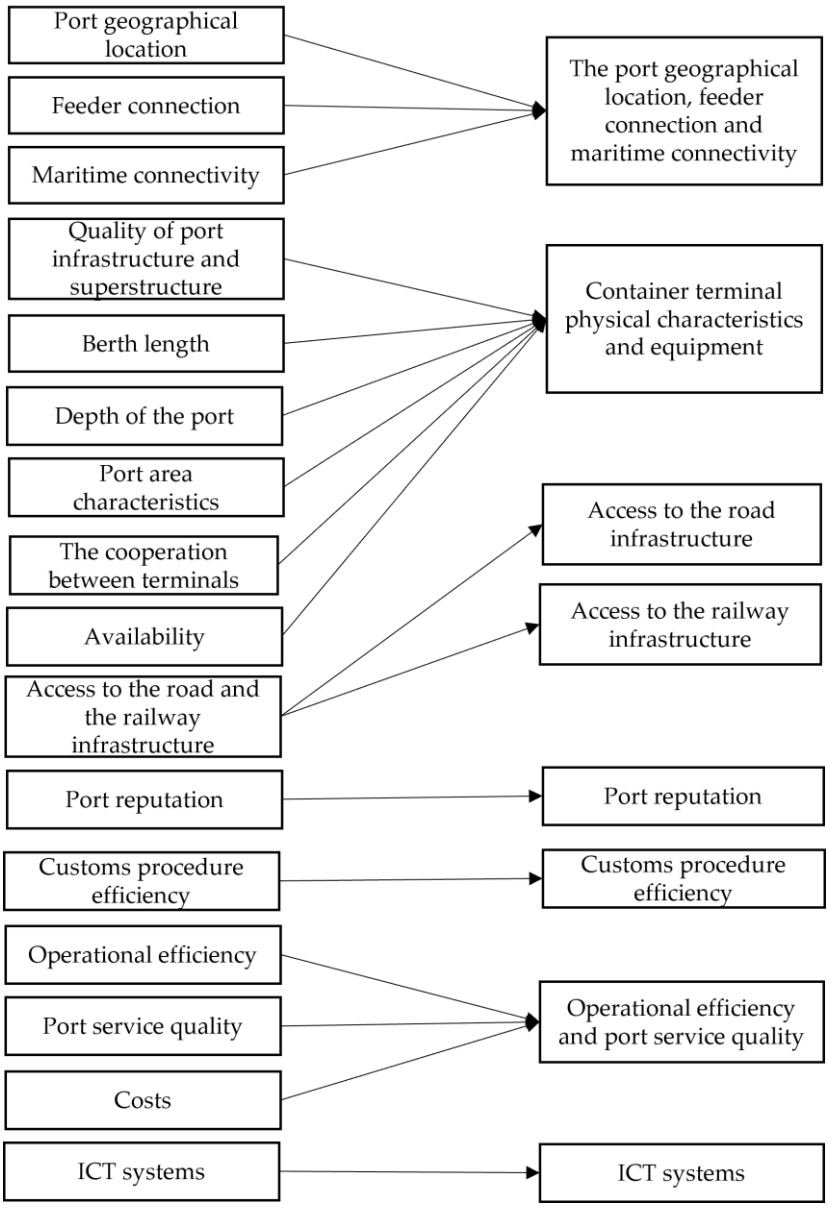

Figure 2. Factor groups.

On the left side are presented the identified seaport competitiveness factors, and on the right are the groups according to which the factors will be analyzed in the case study.

3.2.1. The Port Geographical Location, Feeder Connection, and Maritime Connectivity

Port of Rijeka is the largest and most important seaport in the Republic of Croatia. It is located in the well-sheltered Gulf of Rijeka and, due to its favorable geographic position, has become the main transit port in Croatia [35]. The port of Rijeka has a strategic advantage over the ports of the North Sea, as it connects Europe with the Far East via the Suez Canal. Port of Rijeka belongs to the Mediterranean transport corridor (and Pan-European transport corridor Vb), an important transport route connecting it with the European rail and road network. Figure 3 shows the Port of Rijeka's location in regard to its nearest competitors in the Mediterranean Sea, (shown in blue circle) including the gravitation area (shown in green circle, consisting of hinterland and foreland) [36].

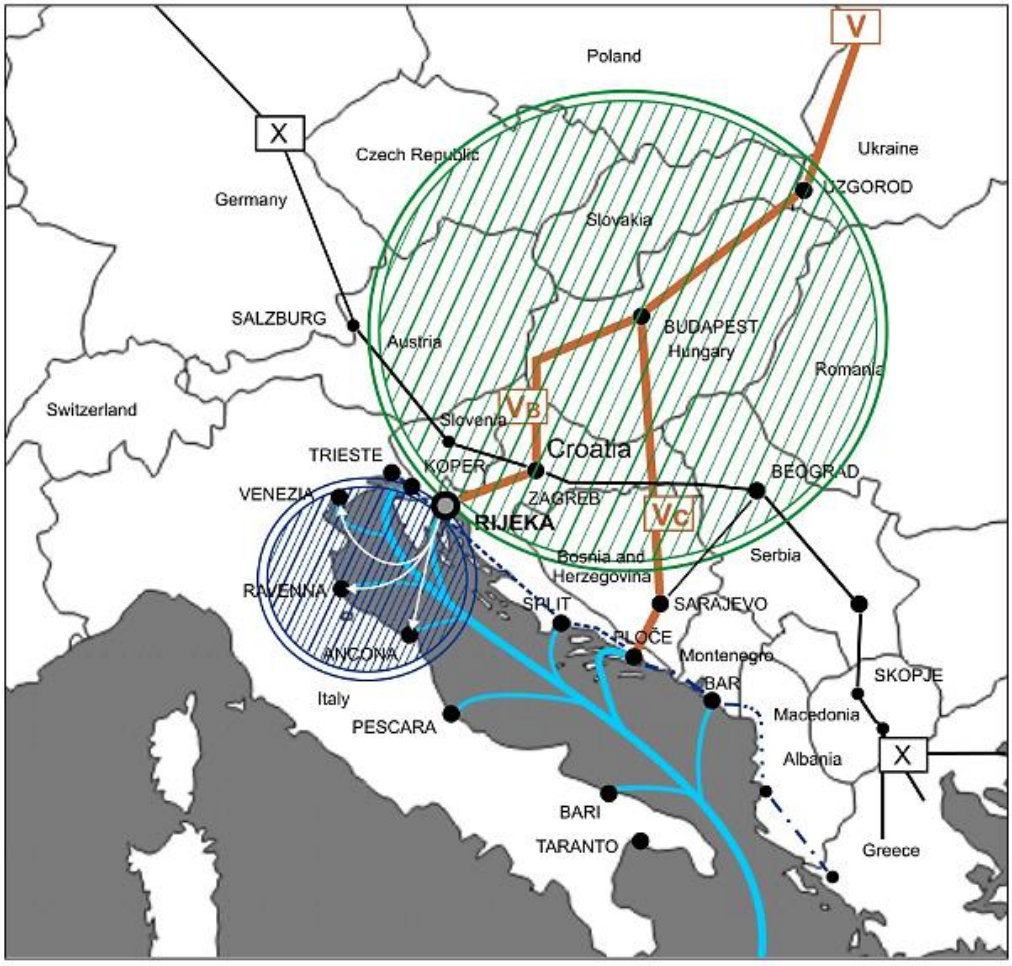

Figure 3. The gravitation area consisting of the hinterland and foreland.

Regarding the feeder connection and maritime connectivity, in container transport, the ship's connection can be achieved with two types of line services: "End to End" and "Hub and Spoke". "End to End" refers to direct service to ships with mother ships (ships connect two overseas regions directly, e.g., China and the North Adriatic). "Hub and Spoke" service refers to the following: mother ships unload cargo from an overseas region (e.g., China) in one of the ports of the Mediterranean (e.g., Malta, Gioia Tauro, Piraeus, Damietta), and it can be transported by feeder ships to the final port (e.g., port of Rijeka). Medić et al. [37] have provided an overview of container services/lines in the Adriatic Sea as follows (services/lines that include Rijeka are singled out, and feeder routes are shown by white arrows in Figure 3):

- CMA CGM: FAS Adriatic Feeder 1 (Malta—Catania—Bar—Ancona—Ravenna—Split—Ploče—Durres—Malta), Adria 1 (Malta—Taranto—Ploče—Split—**Rijeka**—Koper—Trieste—Venice—Ravenna—Ancona);
- MSC: Asia—Mediterranean (Koper—Trieste—**Rijeka**—Trieste—Port Said-King Adullah—Salalah) (Gioia Tauro—Bari—Ancona—Ravenna—Venice—Trieste—Rijeka—Ploče);
- Hapag-Lloyd: Adria Express (ADX) (Piraeus—**Rijeka**—Venice—Ancona—Damietta);
- Maersk Line—49T-Adriatic (Piraeus—Bar—Split—Ploče—Piraeus—Durres—**Rijeka**—Koper—Trieste—Durres).

3.2.2. Container Terminal Physical Characteristics and Equipment

The following identified seaport competitiveness factors will be elaborated in this subsection: infrastructure and superstructure of the container terminal, berth length, depth of the port, port area characteristics, and availability.

Container operations in the Port of Rijeka take place at the Adriatic Gate Container Terminal (AGCT) and Terminal Škrljevo. AGCT is a joint venture of Luka Rijeka (49%) and International Container Terminal Services Inc. based in Manila, Philippines (ICTSI) (51%). The group has contributed to the further development of container transport in the port of Rijeka and the improvement of the transshipment process. With the construction of the second stage of the container terminal, the AGCT can achieve an annual turnover of 600,000 TEU [38], and with the application of state-of-the-art technology solutions, it is possible to increase the projected capacity of the terminal even further.

The newly built part of the terminal allows the use of modern cranes, enabling the handling of ships with a capacity of up to 13,000 TEU and draft up to 14.88 m [39]. It is important to note that ships with this draft cannot be moored along the entire length of the terminal, as the old part of the terminal has a sea depth of 11.21 m, thus preventing the mooring of larger ships. Figure 4 shows the layout of the AGCT terminal and related information [40].

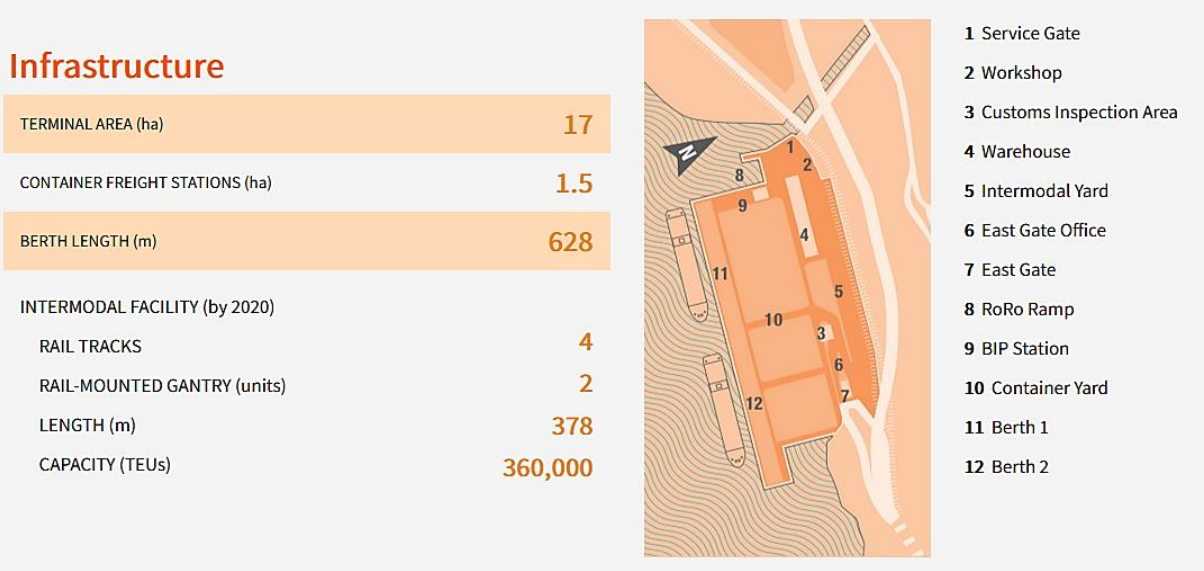

Figure 4. AGCT terminal.

Given that the AGCT's business plan envisaged the transport of up to 60% of the containers by rail [41], it was necessary to significantly increase the existing capacity of the embarkation and disembarkation station for trains. A solution for the reconstruction of the Rijeka-Brajdica corridor station was created, which began in 2018 with the help of the Connecting Europe Facility (CEF) program. The plan was that, next to the crossing section, the reconstructed railway station would have 4 tracks with a length of 420 m (current length: Column 1—399 m, Column 2—389 m, Column 3—420 m, Column 4—420 m) for loading or unloading of containers, equipped with three portal (RMG) cranes for direct manipulation of container wagon trucks [41].

Containers from AGCT are transported to the inland logistics terminal Škrljevo by rail. The terminal Škrljevo is located 10 km from the Rijeka basin, and is considered a free customs zone. It has direct connections with the railway, the motorway, and the roads on the Vb branch of the Pan-European Corridor V [42].

In 2021, the consortium of APM Terminals and Enna Logic signed a 20.5 bil. Croatian kuna (2.7 bil. EUR) concession agreement for Rijeka's Zagreb Deep Sea container terminal [19]. The concession was awarded for a period of 50 years. Under the agreement, the

consortium has the obligation to build a new 280 m long wharf and to guarantee container traffic of one million twenty-foot equivalent (TEU) units in the first two years of operation [19]. The planned capacity of the container terminal is 650,000 TEU per year, with a sea depth of 20 m, which would allow the mooring of the largest container ships [18].

3.2.3. Access to the Road Infrastructure

For the competitive functioning of the container terminal, it is necessary to ensure the road connection between the port of Rijeka and the Croatian state road system, and further with the international roads. This is enabled by the state road D404, which provides a direct connection to the east part of the Rijeka basin on the A6 motorway and the Croatian highway network. In addition, road D404 provides direct access to the container terminal and eliminates truck traffic through the city of Rijeka. Container terminal Brajdica with road D404 also received a strategically extremely important road connection with the 7.5 km distant logistic terminal Škrljevo. The road was fully opened in 2013.

The aim of another project is the building of the road from the Škurinje junction on the A7 motorway which is part of the Trans-European Transport Network (TEN-T) network to the port of Rijeka [34]. The DC403 is especially important for the operation of the Zagreb Deep Sea container terminal. Simultaneously with the construction of the DC403, the Port of Rijeka aims to build the internal connecting road of the port area in the length of 695 m continuing on to the road DC403 to the east, and connecting all port terminals for general cargo in the Rijeka basin with the road DC403 [34].

3.2.4. Access to the Railway Infrastructure

The port of Rijeka is located on the railway freight corridor RFC 6 called the Mediterranean Corridor [43]. The Mediterranean corridor was extended to the Republic of Croatia on 10 November 2016, on the Rijeka–Zagreb–(Budapest) and Zagreb–(Ljubljana) routes [43]. The railway freight Baltic-Adriatic Corridor is in the immediate vicinity.

Rail freight transport from the port of Rijeka is mainly used for longer distances (for example, to Serbia, Hungary, Czech Republic, Slovakia, Bavaria, Southern Poland, and Western Romania). Furthermore, the railway traffic from Rijeka to the markets of Central Europe (mainly Hungary, Czech Republic, Slovakia, Southern Poland, and Northern Romania) is not very developed. The reason for this is the free movement of goods from these countries within the EU, enabling the choice between the Baltic ports, the Adriatic, and recently Piraeus. This is also a serious obstacle to the general development of railway traffic from the port of Rijeka. Geomorphological constraints (the Alps) are also very important, which hinder rail traffic from the port of Rijeka towards, e.g., Germany and Austria. This leaves two logical directions for rail freight transport development: towards Budapest and towards Belgrade.

In addition to this, there are very specific limitations regarding railway transport. First of all, the uncommonly high slope of 28 ‰, which can only be avoided by building a new railway infrastructure. The rest of the restrictions below can be avoided by better traffic organization:

- Difficulties in driving and weather conditions: During the train ride on uphill from the Port of Rijeka, there are many difficulties due to the large track incline, curve radius, and S curves where long trains excessively lean and make it even more difficult to tow the cargo.
- Railway sections and curve strips (s-curves): The Rijeka Brajdica-Drivenik railway section is a section with a steady climb of 30 km. Already the beginning of the section represents a big challenge where trains enter a tunnel between Brajdica and Sušak-Pećine, exerting very high track friction due to the constant railway curving.
- Insufficient track length at the stations: In the Rijeka Brajdica-Moravice section, trains with a total length of 500 m cannot run from the port of Rijeka without being coupled at the Moravice station.
- Speed limits: Due to frequent works on the railway and rough terrain, the rail infrastructure operator HŽ Infrastruktura Ltd (Zagreb, Croatia). often introduces very

restrictive temporary speed limits that are later transformed into regular, permanent speed limits. Furthermore, because of the poor mobile phone coverage and radio signal coverage on some sections of the railway track.

- Unnecessary stopping on the incline: Due to the configuration of the terrain and layout of the railway, railway workers need to stop trains arriving from both directions. In some cases, this leads to difficulties in starting the trains again, especially in adverse weather conditions (rain, snow) or in the autumn when the track is covered with leaves.

Effective loading/unloading operations at container terminals are of large importance in ensuring the competitiveness of the entire transport route. The effectiveness of the operation is determined by the operator's expertise, the condition, and the number of tracks. Additionally, the competitiveness of the transport route is also determined by whether it is possible to form a complete block train at the terminal or if it is necessary to spend extra time and money to join the train sections, thereby increasing the time and cost.

3.2.5. Port Reputation

One of the factors affecting the reputation of the port is the level of development of the sales network and representative offices in the gravitational area. From the available data published on the competitor's online sites, it is possible to deduce the following:

In the countries of the land gravitational area as well as in overseas gravitational areas, neither the Port Authority of Rijeka, nor the largest concessionaires in the port of Rijeka area have their own representative offices to maintain good contacts with carriers, freight forwarders, shipping agencies, operators and railway companies in the transport and logistics sector, trade associations and political decision-makers.

In addition to the representative network, an important factor for the promotion of the port transport route is the means and the intensity of advertising landline rail services. The research has shown that information regarding operated railway routes and departure frequencies, including import, export, and block trains, is available on the container terminal concessionaire's website [44].

3.2.6. Customs Procedure Efficiency

Current customs procedures and the competitiveness factors of the Rijeka transport route are outlined in the following sections.

"Procedure 42" is a customs legislation institute that allows the release of goods into free circulation and VAT exemption in one European Union member state, although the ultimate destination of goods is in another member state. Procedure 42 allows the importer, at the time of customs clearance, to pay only the customs fee until the VAT is declared and paid in the final destination country by the delivery of the goods. Until 2014, foreign entities had to obtain a tax number in the Republic of Croatia in order to use this procedure. Procedure 42 is aligned with all other member states.

The Tax Code of the Republic of Croatia stipulates that at the time of the release of goods into free circulation in Procedure 42, besides the above-mentioned VAT number of the tax representative, in the Republic of Croatia should also include the VAT number of the acquirer from another member state as well as all the evidence on which the goods are imported and further dispatched to the ultimate acquirer in the other member state (invoices, transport documents, statements of VAT payment, etc.). The tax number of the acquirer presents a problem because the end destination of the goods is unknown. In other member states, it is enough to enter the tax number of the person who is the intermediary of the goods, no matter who the end (real) buyer is. It is essential that goods leave the country where goods are released for free circulation, and that further tax collection can be traced through a tax agent. In order to simplify the procedure, it is necessary to amend the tax regulations in order to be aligned in all member states.

In addition to Procedure 42, there is also a delay in the payment of VAT. A receipt of goods and VAT in the final destination country is carried out once a month, so the final customer has an ideal postponement of one month's payment of VAT. For this reason, some

Croatian companies have moved on to release goods to the port of Koper. Taxes must be paid immediately, but they receive a delay of 30 days of VAT payment, while in case they do so in Rijeka, the total customs debt (customs and VAT) must be paid within 10 days. Such a provision for deferred VAT payment of 30 days does not exist in the Republic of Croatia, and this is one of the advantages of the port of Koper compared to Rijeka.

These are two main reasons why Procedure 42 is not used more frequently in Rijeka. If there will be a change in the tax regulations and use of Procedure 42, even though the final destination of goods within the EU is unknown, and if the Ministry of Finance in the Republic of Croatia can delay the payment of VAT for certain (regular) economic entities from the Republic of Croatia, it might contribute to increase of the competitiveness of Rijeka's transport route and, consequently, increase the traffic through the port of Rijeka.

3.2.7. Operational Efficiency and Port Service Quality

The inconsistencies in working timetables of various stakeholders may disrupt the business flow and seaport effectiveness, which ultimately leads to increased costs. [45]. From the analysis of the working time of different stakeholders, the following mismatches were identified [45]: different starting/ending times and duration of shifts, different periods of regular and overtime work, different periods of shift breaks, and different surcharge percentages for overtime work [45]. For example, both the Maritime Police and Customs operate 24 h a day, but the shift of the Maritime Police changes an hour earlier compared to the shift of the Customs. Ship and cargo agents and forwarders normally operate from 08:00 to 16:00 on weekdays. However, if the job requires, they provide their services around-the-clock [45]. In order to enable uninterrupted business, it is necessary to synchronize the working shifts of the stakeholders who operate around-the-clock, and whose joint presence is indispensable.

In addition, the quality of the service may be more important than the price. For example, Petrlić, A. et al. compared the tariff lists of the Port of Rijeka and the Port of Koper. They concluded that in this segment, the Port of Rijeka has a competitive advantage due to lower port charges. However, according to their research, lower prices do not mean better service and higher cargo traffic. Furthermore, they concluded that the Port of Rijeka has insufficiently exploited the benefit of lower port charges, taking into consideration that some service users may be governed by lower costs and higher pricing flexibility [20].

3.2.8. ICT Systems

The Croatian Ministry of the Sea, Transport, and Infrastructure has recognized the importance of digitalization, and has launched several projects in order to solve the administrative problems faced by the maritime transport stakeholders [46]. One of the projects is the establishment of the National Single Window, an information platform for data exchange and processing through the cooperation of the Ministry of the Sea, Transport and Infrastructure, the Customs Administration of the Ministry of Finance, the Port Authority of Rijeka and the Port Authority of Ploče. Since the electronic process of announcement and registration of arrivals/departures of ships in international shipping is mandatory, the Croatian Integrated Maritime Information System (CIMIS) was established in 2013. Another project is related to a new service CIMISNet, in order to enhance data exchange, and reduce administrative procedures among Ministries, all Port authorities, the Ministry of the Interior, the Customs Administration, Coastal Liner Service Agency, Croatian Bureau of Statistics, etc. [46]. The latest CIMISNet specification was drawn up in mid-2021. The third project is a Port Community System, still under implementation in 2022, and is identified as one of the key elements facilitating seaport development [47]. The development costs of the Port of Rijeka PCS are around 1.5 mil. EUR [48], with an expected increase. Despite the increased implementation and maintenance costs, in the long run, PCS may help the stakeholders of the port processes reduce logistics costs through faster information flow [49].

The PCS of the Port of Rijeka is an electronic platform that connects several information systems managed by various stakeholders who are involved in cargo transportation and accompanying activities and procedures. However, the type and process of their activities are different, and mostly depend on the profile, activities, and interests of individual stakeholders.

Therefore, the stakeholders are divided into individual groups of system users. Within each group, each user has control over the protection of his own data, the right to view the data for which the user is authorized, and the right to use and manipulate this data [50].

Certain stakeholders have implemented their own information systems, and the web interface of these systems provides access to authorized external users [51]. However, the simultaneous use of several different information systems and business logic for performing complex business processes may represent an issue. Furthermore, most of these systems are not connected to the information systems of other stakeholders. In this respect, the successful implementation of PCS depends on cooperation between stakeholders.

The Port of Rijeka is behind the global trend when it comes to the Industrial Revolution 4.0, which can be defined as the agenda "to integrate the information and communication technology, as well as to encourage a more digitalization and information oriented industry" [52]. According to Jeevan, J. et al. four stages are necessary for the implementation of the Industrial Revolution 4.0 in the seaport industry: adoption, implementation, operational, and evaluation [53]. In this respect, the first step toward it is in progress in the Port of Rijeka, considering the recent implementation of PCS and National Single Window.

4. Discussion and Conclusions

The review of existing research has shown that the majority of authors focused on specific seaports or specific areas in their research related to seaport competitiveness, and it can be concluded that each seaport or area has its own characteristics and needs. Based on that, we can conclude that despite the differences of each seaport, certain factors for container seaport competitiveness are universal, such as the quality of port infrastructure and superstructure, access to the road and the railway infrastructure at the port hinterland, costs, port service quality, etc. Furthermore, due to the emergence of new digital technologies, the possibilities of the digitalization of business processes in container seaports are increasingly recognized.

After analyzing the papers with a focus on the Port of Rijeka, only several factors affecting seaport competitiveness were elaborated, which also indicates a research gap. Research is mainly focused on comparing the Port of Rijeka with the ports of Koper and Trieste. The factors which were analyzed in the previous research are container terminal equipment, number of liner services, transport network, port tariffs, infrastructure, and implemented quality management systems. However, port geographical location, access to the road and railway infrastructure, port reputation, customs procedure efficiency, and digitalization are also very important. In addition, after the analysis, it is possible to answer the research questions:

- Does the Port of Rijeka have the prerequisites to become a competent seaport?

Port of Rijeka has the prerequisites to become a competent seaport. The Port of Rijeka is the largest and the most important seaport in the Republic of Croatia, considering a strategic advantage due to its geographic position over the ports of the North Sea. The port of Rijeka is located on the Mediterranean Rail Freight Corridor of the TEN-T network, and is in the vicinity of the Baltic-Adriatic corridor. Container operations in the Port of Rijeka take place at the Adriatic Gate Container Terminal and Terminal Škrljevo. Rijeka's "Zagreb Deep Sea terminal" will add additional capacity (650,000 TEU per year) to the already existing facilities of the above-mentioned two terminals. Regarding the road infrastructure, the construction of the state road DC403 is very important for the increase of the competitiveness of the port of Rijeka. The goal is to build the connecting road from the Škurinje junction on the A7 motorway, which is part of the TEN-T network to the port of Rijeka. Regarding the Industrial Revolution 4.0, although the Port of Rijeka is behind the global trend when it comes to the Industrial Revolution 4.0, the first step toward it is in progress, considering the recent implementation of PCS and National Single Window.

- What does the Port of Rijeka have to improve in order to become competitive?

Given that the port's position is not sufficient to gain a competitive advantage, other factors must be considered. Table 3 shows proposed measures in order to improve the competitiveness of the Port of Rijeka, which represents the main research contribution of this paper.

Table 3. Proposed Measures to Improve the Competitiveness of the Port of Rijeka.

No.	Activity	Maturity	Responsible Stakeholder	Activities	Key Performance Indicator
1	Collecting and publishing statistics on seaport and hinterland terminals (e.g., ESPO statistics)	ready	Port of Rijeka Authority	-analyze the current situation -develop the methodology of data collection -obligate responsible statutory managers	Improvement of statistical model and analytical methods
2	Synchronize the working hours of all stakeholders in the seaport	ready	Port of Rijeka Authority	-analyze the current state -make a synchronization proposal -inform representatives of stakeholders and relevant ministries of the proposal and the necessity of synchronization	Increased productivity and reduced shipping/ waiting time Increased competitiveness of the transport route
3	Ensure the inclusion of the Rijeka in the Baltic-Adriatic corridor	idea	Ministry of the Sea, Transport, and Infrastructure	-be active in promoting the importance of including Rijeka in the Baltic-Adriatic corridor -organize scientific and professional meetings -create a professional background	Increase of available resources for the development of transport route
4	Implementation of the railway tracking and cargo tracking system	idea	Ministry of the Sea, Transport, and Infrastructure	-make a professional elaboration of possible technological solutions -involve stakeholders in developing an optimal technological solution -provide financial resources with the possibility of using European Union financial instruments	Increased competitiveness of the transport route
5	Ensure a systematic promotion of Rijeka's transport route at all levels	idea	Port of Rijeka Authority	-analyze the status and needs of the target market -set a clear goal and vision of the promotion activities -determine promotion focus (regions, transport routes, target markets) -create promotional concepts with action plans for each promotion level -provide financial resources -implement promotion activities at all levels -build awareness of local stakeholders on the importance of promotion -conduct systematic training of local stakeholders on the ways of promotion	Increased competitiveness of the transport route

Table 3. *Cont.*

No.	Activity	Maturity	Responsible Stakeholder	Activities	Key Performance Indicator
6	Provide a sales network in the gravitational area	ready	Port of Rijeka Authority, concessionaire	-determine the target market -open a representative office -maintain contacts with numerous companies in trade and industry, including carriers, forwarders, shipping agencies, operators and rail companies in the transport and logistics sector, trade associations and political decision-makers, -an analysis of potential clients -exchange of market information, and contacts	Increased competitiveness of the transport route
7	Ensure the visibility of current rail services	ready	Port of Rijeka Authority, railway operators	-organize educational workshops on the promotion of services -build the awareness of the necessity of ensuring the visibility of the services provided	Increased competitiveness of the transport route
8	Ensure larger use of customs Procedure 42	Idea	Ministry of Finance (Customs Administration)	-to modify the tax code in a way to allow the release of goods in free circulation in cases where the ultimate destination of the goods is unknown and the monitoring of the collection of tax by the tax agent -allow the delay of VAT payment for regular business entities for at least 30 days	Increase in container traffic Increased competitiveness of the transport route
9	Improving railway infrastructure on the routes towards Budapest and Ljubljana	Idea	Ministry of the Sea, Transport, and Infrastructure	-analyze the current state -create technical documentation -establish bilateral negotiations with the Republic of Slovenia -provide financial resources with the possibility of using European Union financial instruments	Increase in container traffic Increased competitiveness of the transport route

The conclusion is that the Port of Rijeka has the opportunity to attract cargo from the hinterland and to set up the foundation for its future successful development.

This research has several limitations, which may also serve as future research directions. First, the research is focused only on the Port of Rijeka and Croatia. Second, only qualitative methods were used, and for a deeper understanding, it would be necessary to apply quantitative methods as well. In addition, in future research, it would be necessary to focus in more detail on certain factors, for example, the connection of the Port of Rijeka with the hinterland. Furthermore, the comparison of ports of Koper, Trieste, and Rijeka may represent another research direction, as the ports are geographically close to each other.

The contribution of this study is twofold. First, the results of the study enrich the body of knowledge in the field of container port competitiveness, and may provide a baseline

for the future research design. Secondly, the research can help the practitioners in shaping their strategies, particularly in the Port of Rijeka, Croatia.

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