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Developing Countries' Concerns Regarding Blockchain Adoption in Maritime

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Abstract: This paper deals with challenges of implementing blockchain (BC) technology in maritime at developing countries, with a research focus on Montenegro and South Africa. Research design and categories analyzed in the paper are chosen due to the search of relevant secondary literature resources. Selected experts in Information Technology (IT) and maritime from aforementioned developing countries were asked about their perception of BC as disruptive technology, its implementation, and implications on maritime and other industries, through a questionnaire, which contains both quantitative and qualitative parts. The results should give the readers insights into the experts' standpoints concerning rational blockchain adoption in maritime and other industries in developing and transitional economies. The paper is organized into six sections: (1) introduction, (2) literature review on blockchain in maritime, (3) research problem and design, (4) results, (5) discussion, and (6) conclusions.

Keywords: blockchain (BC); adoption; challenges; developing environments

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1. Introduction

Blockchain is a new, transformative technology and business model based on digitalized, shared, distributed, and synchronized ledger. A ledger is comprised of unchangeable, digitally recorded data in blocks. Blockchain enables dealing with smart contracts, recording transactions, and tracking assets in both physical and virtual spaces. Assets can be tangible as money, land, properties, vehicles, etc.; and intangible as energy, patents, intellectual property, copyright, etc. Therefore, blockchain allows an untampered record of transactions over physical and virtual goods [1]. The network nodes within blockchain must validate and approve transactions before their packing into timestamped blocks, which form chains. This requires complex internodes communication and consensus mechanism [2].

Blockchain transforms business from centralized and human-based to a shared, algorithm-based system, which implies a new risk management paradigm [3].

The idea of blockchain arose in 2008 [4], and since then the discipline has been continuously evolving [5]. At the beginning, blockchain was a technological background for bitcoin. As a technology, blockchain can organize bitcoin transactions. Thereby, bitcoin is decentralized peer-to-peer crypto currency for exchanging goods and services virtually through sophisticated cryptography payment mechanisms. Due to the robustness of these mechanisms involved and consensus requirements, a bank as a third party is not needed. The nodes in the blockchain are anonymous, and as such, they can provide more security to other nodes to initiate and confirm the transaction. Besides cryptocurrency applications, blockchain is applied in healthcare, smart energy grids, and supply chains [6]. In healthcare, blockchain serves mostly for tracking medical devices and medicines, using

patient biometrics for identification and for measuring and recording patient vitals. When it comes to smart energy grids, there is considerable interest in green and renewable energy sources, including bio-fuels, hydroelectric, solar, and wind energy. The availability of a local energy market implies that participants have a choice of using the local grid when its price is lower than that of the external grid. The blockchain dimension of this includes management of contracts and dynamically determining prices. It offers the opportunities to support the local grid and local renewable energy suppliers.

Besides healthcare and smart energy grids, blockchain finds its application in supply chains that are systems of organizations, people, activities, information, and resources involved in moving products or services from suppliers to customers. Manufacturing and trading of goods is becoming complex due to the increased number of intermediaries between the producer and the final consumer. Globalization and market expansion forced companies to expand their products and life cycle, to meet new markets and requirements [1]. Consequently, supply chain is an ecosystem that involves designing, engineering, manufacturing, and distributing products and services from suppliers to end-consumers worldwide [7].

There is a number of studies that focus on using blockchain technology in various application aspects, but there is no comprehensive survey on the blockchain applications in maritime shipping supply chain [8]. However, recently, Liu et al. [9] dealt with pilot initiatives of blockchain applications and pain points in maritime supply chain. In addition, Tsiulin et al. [10] dealt with block-chain based applications in shipping and port management through literature review towards defining key conceptual frameworks. Zhou et al. [11] considered key challenges and critical success factors (CSFs) of blockchain implementation in the maritime industry, based on studies conducted across Singapore maritime industry.

Since shipping provides mass, low-cost, efficient transportation services, it is the main form of global transportation. Maritime shipping services involve complex partners and deal with numerous transport documents, which can slow down delivering goods from one party to another [12]. Blockchain has been gradually introduced to the maritime shipping supply chain to improve efficiency through the digitalization of maritime shipping records, including keeping real time track of the status of cargos; improving visibility; and reducing consumers' clearance time, costs, and risks.

2. Blockchain in Maritime

Blockchain is designed to record and track transactions. It is very important to understand this technology to become capable to deploy it rationally across maritime clusters for containers tracking and tracing, near-instant logistics adjustments, automated risk management, insurance purposes, and more. Blockchain technology starts to build a block or individual blocks that become a chain, and that is a ledger. One can put information in a ledger, while all involved in the transaction can see that information. If a mistake is made, one has to build a new block that relies on the block before it. If one has multiple transactions, that person can build multiple blocks with multiple people and everybody can see the progression of whatever these multiple transactions are. This is a great advantage from a logistics, accounting, and risk-management perspective to be able to see all these.

One of the pieces behind blockchain technology is so-called Hyperledger. Blockchain programs are built on this platform or framework. The IBM has moved blockchain from in-house to Linux Foundation, and consequently all the code is open source, as a catalyst to move blockchain forward into different industries, including maritime [13]. Danish Maersk uses IBM-established collaboration through the TradeLens platform in 2017 to track container locations, cargo details, trade documents, and sensor readings [14]. The TradeLens offers the oversight control and automated risk management to every stakeholder in the supply chain: beneficial cargo owners, ocean carriers, ports, terminal operators, inland carriers including rail and tracking, shippers, freight forwarders, customs authorities,

financial service providers, etc. The TradeLens uses Hyperledger Fabric permissioned blockchain to guarantee the immutability and transparency of trade documents [15]. It has a powerful Application Programming Interface (API) model, but it is easy to use web interface to deliver insights into equipment number, bill of lading number, cargo manifest number, booking number, and all-important information related to the container shipment. Key milestones that include hundreds of events can be followed up and down the supply chain, including near-instant logistics adjustments, so disruptions are kept to a minimum.

Currently, the platform handles 10 million events and more than 100,000 documents every week [16]. It is worth mentioning that there are 120 shipping events types [17]. Within this context, it is important to note that more than $16 trillion in goods are shipped across international borders each year. Approximately 80% of consumer goods used daily are carried out by the ocean shipping industry. By reducing barriers within the international supply chain, global trade could increase by nearly 15%, boosting economies and creating jobs [18].

Legacy data systems and manual document handling cause friction that costs both time and money for business and people throughout the supply chain. The TradeLens enables unprecedented transparency, collaboration, and efficiency in global supply chain. It provides control and management of shipping data and supplies innovative apps to every stakeholder. Access to shipping data and information is managed by the TradeLens' sophisticated permission model at each stage of shipment and provides a blockchain-encrypted audit trail of all critical actions. The TradeLens document store allows documents to be securely stored, viewed, and actioned by various parties. Documents can be uploaded and shared, as either structured or unstructured (scans or PDFs). The last allows information sharing between supply chain partners with disparate IT capacities. The TradeLens platform permits access to documents according to the permission matrix, so the right people can securely manage their supply chain in real-time. It breaks down longstanding data and processing silos that exist among some trading partners and simplifies the flow of documentation, which accompanies every shipment.

3. Research Problem and Design

Through this research study, we aim to collect the information relevant for blockchain adoption in maritime, in two developing countries, Montenegro and South Africa. As a research strategy, we used a survey as a system for collecting information from people to describe, compare, or explain their knowledge and attitudes towards using blockchain in maritime business. This strategy allows us to collect both quantitative and qualitative data and information. The survey was used for exploratory and descriptive purposes as a one-time or one-shot survey. As the survey instrument, we used self-administrated questionnaires that respondents completed on their own via the computer. After data were obtained through questionnaires, they were coded, keyed in, and edited. The questions were conceived after a detailed study of Upadhyay's (2020) study [5] on 'demystifying blockchain'. In addition, we used Rogers (2003), Lee & Kim (2007), Kapoor et al., (2014), Kim & Laskowski (2018), Kapidani et al., (2020), and Zhou et al. [11,19–25]. We applied triangulation of these various approaches and came up with the key dimensions of our questionnaire (Figure 1).

We used both closed and open-ended questions, while we were avoiding double-barreled, ambiguous, leading, and loaded questions [25]. Closed questions were conceived in a way that participants identify advantages or disadvantages of certain blockchain dimensions, and then chose one of the numerical values of Likert scale: 1, 2, 3, 4, or 5. Where, 1 represents the lowest level of agreement or disagreement, and 5 represents the highest level of agreement or disagreement with the statement. The rest of the offered numerical values are respectively in-between these two extremes. The open-ended questions allow respondents to express their opinion in free writing style. The respondents were selected among IT and maritime experts from Montenegro and South Africa. They are from maritime companies, agencies, research organizations, governmental bodies, insurance

companies, and universities. They are from executive management level at industry and governmental bodies, and active researchers, professors and lecturers from universities. Responses were received back from 20 experts, of which 10 were from Montenegro and 10 from South Africa. The majority of the respondents from Montenegro are partners or external experts at several ongoing European Commission Horizon 2020 projects, while the respondents from South Africa are from universities and the biggest national multimodal transportation company in the country. After reception, the responses were edited, coded, and analyzed, while the obtained results are presented in the next section.

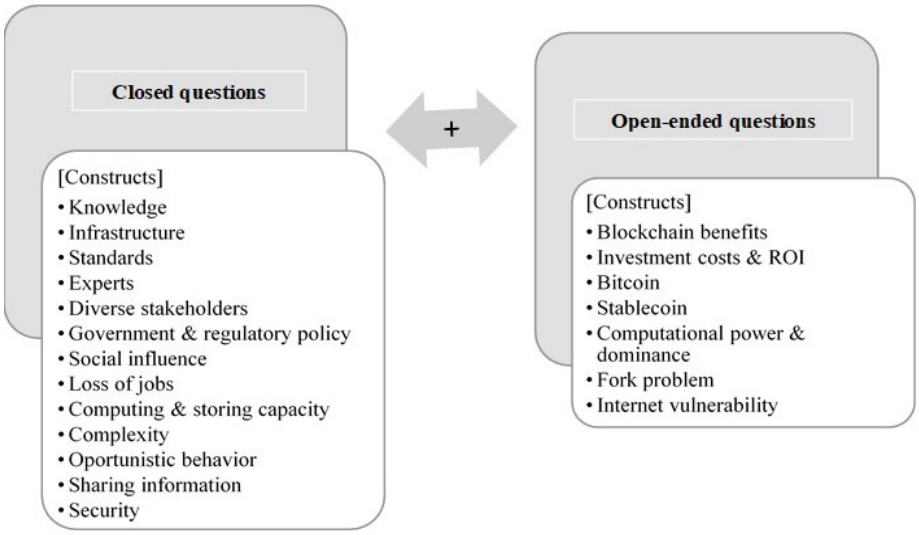

Figure 1. Survey structure and key constructs (Source: Own).

4. Results

All questionnaires sent back by the selected experts were meticulously filled in and there were no missing or 'wrong' data/answers. It was clear that the experts took their roles seriously and understood the importance of the conducted research.

4.1. Quantitative Analysis

The quantitative dimension of the survey analysis comprises average values assigned to "agree" or "disagree" attributes to each considered category within closed-ended questions. The summary of the data analysis is given in Table 1.

Five statements with the highest "agree" and "disagree" assessment rates are categorized in different PESTEL (political, economic, social, technological, environmental, and legal) dimensions, along with their rank (Table 2). The ranks and their connections with PESTEL dimensions will be discussed in the following section.

4.2. Quantitative Analysis

Regarding the qualitative part of the analysis, which was conceived and conducted through seven open-ended questions set around the categories shown in Figure 1, the following issues were considered, and some selected answers given as examples:

(1) Which benefits Montenegro/South Africa might have, for instance, of introducing blockchain solutions in maritime (shipping) industry?
Montenegrin expert: "Allowing tourists to spend their crypto currencies/coins during their stay in Montenegro would bring wealthier tourists. Also, it would bring tourists with crypto savings to spend more money than they planned to spend. The newest technology and tourism always comes together. Bringing wealthy and highly sophisticated digital nomads in and out of high season would bring Montenegro a significant raise in economy. Not to mention other gains like a longer season and employment of local IT experts with a significant raise of GDP. Tracking of tourists'

behavior such as spending and rewarding them with some usable tokens/coins would bring Montenegro tourism, which is dominantly connected with sea, growth, and development."
South African expert: "Blockchain can help by placing the crucial data in one place and creating a unique platform for solution providers, ports, and agents that operate along the supply chain. Allowing tracking cargo in real time using blockchain technology, shipping companies and ports can plan land procedures ahead of time, speeding up terminal works and cutting down costs. Maritime blockchain increases trading safety and transparency. Adopting blockchain technology would elevate the industry to the next level in terms of efficiency and would also impact positively mistakes being done on a daily basis by the personnel in maritime."

(2) It will have lot of cost in terms of time and money to change the existing system, especially when it is an infrastructure. We have to make sure this innovative technology not only creates economic benefits and meets the requirements of supervision, but also bridges with traditional organization, and it always encounter difficulties from internal organization, which is happening now. What do you think accordingly?
Montenegrin expert 1: "Montenegro needs a law that would regulate digital assets, together with crypto exchange and ICO (Information Commissioner's Office) regulation. Tokenizing big tourist investment via crypto would allow the crypto community worldwide to invest in Montenegro future projects."
Montenegrin expert 2: "Definitely, technology is advancing faster than human habits. Are our brains ready for all technological changes, and all that information delivered every day? Adoption is very slow; most of the people do not even use credit cards or e-banking services. It just needs decades, for new digital generations to come."
South African expert 1: "Blockchain technology will transform the maritime industry, as it is still struggling with high costs and a high level of pollution. Blockchain technology can help with both issues, by cutting down administrative costs and providing environment-friendly solutions."
South African expert 2: "Yes, changing from the old system to the new one will have a lot of financial implications for the organizations, but I consider it will be worth it, and ultimately will come with a lot of positives to the traditional organizations."

(3) Use bitcoin for example, the characteristics of the decentralized system will weaken the central bank's ability to control the economic policy and the amount of money, which makes government be cautious of blockchain technologies. Authorities have to research this issue, accelerate formulating new policy, otherwise, it will have a risk on the market. To which extent do you agree with this statement?
Montenegrin expert: "Bitcoin is unstoppable; its network is not censorable. There is no sanctions, no age, gender or any other restrictions. It is free for whole world to use it with the same rules for all. Banks will embrace bitcoin. It will become exchangeable in every bank as the dollar is today. Bitcoin is safeguarded against limitless money printing. It would not replace dollar or euro, but it could be complementary to gold, something as 'digital gold'."
South African expert: "Government will have to look at this system from all different angles in an attempt to find any serious loophole that might come with the system, especially in institutions like banks."

(4) Are you familiar with 'stablecoin'?—Can it assist regarding the previous challenge and in which way?
Montenegrin expert 1: "Local stable coin would bring to Montenegro the newest technology and long-awaited Easy Payment/PayPal-like options, which would for sure boost the Montenegro economy. If most merchants accept stable coin, this will lead to a significant Montenegro economy boost."
Montenegrin expert 2: "Major central banks are running pilot projects with stablecoins. The key question is how money laundering, tax heavens, and corruption will work with stablecoins that are more transparent than current financial systems. I guess we

shall have transparency for ordinary people, while big players will continue to hide their wealth."
South African expert 1: "I am familiar to a limited extent."
South African expert 2: "I am honestly not familiar with stablecoin."

(5) Even though it is an advanced technology, blockchain still struggles with some security issues. For instance, if someone has more than 51% computing power, then he/she can find nonce (number blockchain miners are solving for) quicker than others can, which means that he/she has authority to decide which block is permissible. What is your opinion concerning this issue?
Montenegrin expert 1: "There are several technologies developed, which practically make the 51% attack almost impossible to happen if applied correctly. Still, I always suggest using strong BC projects with huge hash power mining community—POW Blockchain networks, like Ravencoin, BitcoinCash, etc., or some reputable Blockchain netwoks—POS, like Etheraum, Ripple, etc."
Montenegrin expert 2: The 51% is really for smaller coins, but not for bitcoin. This is only a theoretical threat for the bitcoin network, and here is why. Firstly, it will cost billions in equipment to achieve that big hashrate with dubious benefits. The price of bitcoin will go sharply down. Bitcoin mining system is made that way to be more profitable to the honest miner. If an attacker could control the network for a longer period of time, the value of bitcoin would go down to zero, because trust in the bitcoin network would be zero. So, they would manage to get control of a lot of bitcoins that would be worthless. Not to mention worldwide storage of chips, such attack is not even possible right now."
The South African experts consulted from maritime industry were sincere and stated that this issue is beyond their scope of interest and expertise presently.

(6) Another issue is the 'fork' problem. It is related to decentralized node version agreement when the software is upgraded. Then, nodes are divided into old and new ones, and different problems of their mutual communication can appear.
Montenegrin expert 1: "It is democracy, who ever have 51% or more votes, it's a legit version of BC. There will be always one bitcoin, no matter how many times they fork it."
Montenegrin expert 2: "Some argue that while no technology is completely secure, no one has yet managed to break the encryption and decentralized architecture of BC. Decentralized networks can be much or less resilient to shocks, which can affect participants directly, unless careful thought is given to their design."
However, the majority of the consulted respondents are not familiar with this particular issue.

(7) Blockchain uses internet. Does it mean that it is prone at this instance to common internet attacks like 'botnets', for instance?
Montenegrin expert: "BC is not prone to classical botnet attacks, but there are similar ones. Especially when fees for transactions are low, multiple spam attacks are aimed to slowdown transactions and increase fees. Nevertheless, those people are just 'burning' their money, with increased fees; they increase the cost of the spam transactions also."
South African expert: "This is something we live with for all internet services. However, with proper implementation, monitoring, and improvement that would be made on the BC system over time, it would not be prone to any internet-related attacks."

Table 1. The assessments of considered blockchain (BC) adoption dimensions (Source: Own).

Statement	Agree	Disagree
1. The level of awareness and knowledge of BC affects its adoption.	4 + 5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 + 4 + 5 + 4 + 4 + 5 + 5 + 4 + 4 + 5 + 4 = 9.30	-
2. The BC adoption is affected by the availability of the infrastructure and functionality to integrate and interoperate within and across the business ecosystem.	1 + 5 + 5 + 3 + 5 + 5 + 5 + 3 + 5 + 5 + + 5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 + 4 + 5 = 9.10	-
3. Standardization and ensuring smooth interoperability is necessary, otherwise, BC can make things difficult instead of making them easier.	4 + 3 + 4 + 3 + 5 + 5 + 5 + 5 + 4 + 5 + 5 = 4.30	2 + 5 + 1 + 3 + 3 + 2 + 3 + 5 + 5 = 3.44
4. The BC adoption is affected by the availability of skilled and expert resources.	1 + 5 + 4 + 4 + 5 + 5 + 5 + 5 + 5 + 5 + + 5 + 5 + 5 + 4 + 4 + 3 + 5 + 4 + 4 + 3 = 8.60	-
5. The BC adoption is affected by a large number of stakeholders, with different mind-sets, organizational culture, and working habits.	3 + 4 + 4 + 5 + 3 + 4 + 4 + 4 + 4 + 4 + +4 + 5 + 5 + 4 + 3 = 3.80	1 + 1 + 1 + 2 + 1 = 1.20
6. The BC adoption is increased by favorable government and regulatory policies.	5 + 3+5 + 4 + 2 + 4+5 + 2 + 5 + 5 + + 5 + 5 + 4 + 4 + 5 + 5 + 5 + 5 + 5 + 4 = 8.70	-
7. Social influence positively affects the behavioral intention of using BC.	4 + 4 + 4 + 5 + 3 + 3 + 5 + 2+3 + 2 + + 4 + 3 + 4 + 5 + 2+3 + 4 = 3.53	2 + 2 + 3 = 3.50
8. A perception that BC implementation might lead to loss of jobs can be an obstacle in its adoption.	3 + 1 + 5 + 4 + 5 + 5+4 + 3 + 5 + 4 + + 3 + 4 + 4 + 5 + 5 + 5 = 4.06	2 + 5 + 1 + 5 = 3.25
9. Development in storage, computing, and cloud infrastructure will affect the BC adoption.	2 + 5 + 5 + 5 + 5 + 5 + 5 + 4+ + 4 + 3 + 5+5 + 4 + 5 + 4 + 4 + 4 = 4.35	2 + 2+1 = 1.67
10. The BC adoption reduces opportunistic behavior (opportunistic behavior means maximization of economic self-interest and occasioned loss of the other partners).	1 + 4 + 4 + 3 + 3 + 3+5 + 5 + 3 + 4 + 2 + 4 + 3 = 3.38	1 + 5+4 + 5+5 + 4 + 5 = 4.14
11. The BC adoption is reduced if the information is not shared by the partners, while some stakeholders are hesitant to share information considering it is a competitive advantage.	3 + 5 + 5 + 4+5 + 4 + 5 + 5 + 5 + 4 + + 3 + 4 + 5 + 4 + 3 + 5 = 6.90	1 + 3 + 5 + 1 = 2.50
12. Privacy and security of models and data need to be ensured, as BC technology is still immature and vulnerable.	5 + 5 + 4 + 4 + 3 + 4 + 5 + 5 + 4 + 4 + 5 + 4 + 4 + 3 = 3.9	2 + 3 + 3 + 2 + 1 + 1 = 2.00
13. Blockchain offers a high level of complexity and observability at the same time.	4 + 2 + 5 + 3 + 5 + 5 + 2 + 5 + 3 + 5 + + 4 + 5 + 4 + 4 + 5 + 3 + 2 = 4.47	5 + 4 + 4 = 4.33

Table 2. PESTEL quantitative analysis of selected constructs that affect BC adoption in developing countries: Montenegro and South Africa (Source: Own).

P Political	E Economic	S Social	T Technological	E Environmental	L Legal
Respondents "Agree"					
* Favorable government policies (rank 3)	* Hesitancy of sharing information (rank 5)	Awareness and knowledge about BC (rank 1) Skilled and expert resources (rank 4)	Infrastructure (rank 2)	* Hesitancy of sharing information (rank 5)	* Favorable regulatory policies (rank 3)
Respondents "Disagree"					
	Reduction of opportunistic behavior (rank 2)	Social Influence (rank 3)	Complexity and observability (rank 1) * Standardization (rank 4) ** Ensuring privacy and security (rank 5)	** Ensuring privacy and security (rank 5)	* Standardization (rank 4) ** Ensuring privacy and security (rank 5)

5. Discussion

As a result of summarizing the respondents' quantitative answers, divided into two categories: "agree" and "disagree", the ranks of five constructs assessed with the highest scores for both considered categories are additionally categorized into PESTEL dimensions, while the following can be drawn out:

- The respondents consider awareness and knowledge about BC as a social dimension of utmost importance for BC adoption in maritime and related industries. This is understandable, since knowledge is the biggest asset; the only one that grows with exploitation during the time. Second is infrastructure, which falls under technological dimension. This is reasonable, since without it, BC adoption is practically impossible. Third are favorable government and regulatory policies that fall under political and legal dimensions. This is of crucial importance, since in developing countries like Montenegro and South Africa, the economy and its development are controlled by the government (i.e., the reminiscence of socialism that was an actuality in Montenegro in the past, and which is currently tried to be developed in South Africa). Fourth is experts' knowledge, which belongs to social dimension of PESTEL model, and which is to a certain extent connected with awareness and knowledge, but it can be outsourced in the case of its lack, and under the assumptions that awareness and general knowledge about BC are present. Fifth is hesitancy of sharing information among the parties, and it falls under both economic and environmental dimensions of PESEL. This is understandable, since once BC becomes well-established, the impact of this issue will be reduced, and therefore the related statement is at the last position among selected constructs.
- The highest disagreement is observed regarding the 'simultaneous' presence of BC complexity and observability. The majority of respondents show suspicion regarding this paradox, which is logically understandable. Then, respondents do not agree with the statement that BC will reduce opportunistic behavior. Montenegro and South Africa are countries that for decades have been in a transition, and suffer from the permanent reproduction of crises and injustices. Consequently, their rather skeptical attitude towards this statement is completely understandable. Social influence is in third place. The respondents do not believe that society can impact the implementation of this advanced technology, and this belief is based on their experiences from transitional settings. The statement, which deals with standardization issue, is 'negatively' assessed, but it might be the case due to the experts' belief that standardization must be achieved and that it cannot as such diminish BC key advantages. Ensuring

privacy and security is negatively assessed, as well. This means that some respondents disagree with the statement that BC technology is still immature and vulnerable. Due to their response, one can conclude they believe that BC technology is at a high level of development, that it is less vulnerable, and that it can appear due its complexity and deployment at a global scale. This construct can correspond with technological, environmental, and legal PESTEL dimensions at the same time.

By analyzing the respondents' open-ended questions set around the constructs: BC benefits, investment costs, bitcoin, stablecoin, computational power and nodes' dominance, nodes interoperability, and internet vulnerability, we synthesized the following:

- Montenegrin experts see benefits in adopting BC for the cruising industry, mostly in terms of easier payment, attracting tourists, increased revenue, distributed development of cruise tourism, etc. Furthermore, due to the experts' opinions, BC could have an application in the management of passengers' flows, market analysis, provision of advanced software for cruise industry needs, etc.
- South African experts express positive attitudes in a way that BC can help by placing the crucial data in one place, while creating a unique platform for IT solution providers, ports, agents, freight forwarders, insurance companies, etc., that operate along the supply chain. The BC allows tracking cargo in real time, while shipping companies and ports can plan land procedures ahead of time, speeding up terminal work and cutting down costs. They believe that maritime BC increases trading safety and transparency. Due to their opinions, adopting BC would elevate the industry to the next level in terms of efficiency and affect it positively in terms of reducing the number of human errors.
- Regarding the costs of introducing BC infrastructure and impediments on changing organizational habits, the experts offered different opinions, but commonly, they believe it should be a part of a much needed and inevitable digitalization process. Changing from the old system to the new one will have many financial implications for the organizations, but ultimately it will come with many positives.
- Concerning the question of the central national banks as a regulatory body, Montenegrin experts see benefits, but in general agree that Montenegro central bank is the commercial banks' control body, rather than central bank. Montenegro does not have its own currency and no reason to consider decentralized crypto currencies as competition to other monetary flows. Of course, experts agreed Montenegro needs digital assets, crypto exchanges, and ICO regulations, which would disable eventual money laundering, frauds, or terrorist financial attacks. On the other side, South African respondents see government as the only entity that can put things under control. In general, South African eyes are usually directed towards the government as a central authority that can assist in solving key economic and social problems in the country.
- When it comes to stablecoin, computational power of BC, nodes interoperability, and cyber security, few Montenegrin experts are familiar with these topics, since they are involved in the EU projects, or work as external experts for foreign maritime institutions, or as adjunct professors at foreign universities. However, the lack of technological knowledge is commonly present in South Africa and Montenegro as countries in transition for more than 30 years. Therefore, strengthening technological knowledge transfer (not only ready-made technology) among developed and developing countries can assist considerably.

6. Conclusions

This paper presents the results of literature review regarding BC adoption in general and in particular in maritime industry and business. The literature sources are scarce and dominantly focused on extensive literature review with few papers that concern concrete applications and related issues. In this study, we screened the opinions of several experts from Montenegro and South Africa as developing countries, concerning the attempt to

adopt BC rationally. The experts in general agree with the suggested benefits of BC examined through the quantitative part of the study. However, some oscillations in their assessments are noticed, but commonly there is an agreement with assumed benefits of BC implementation in maritime. The observed oscillations mean uncertainty due to the lack of knowledge and experience in blockchain implementation in emerging maritime economies. Through the qualitative part of the questionnaire sent to the experts and later analysis of their responses, we noticed again differences in opinions, which we considered in the discussion. The presence of lack of knowledge and confidence when it comes to some concerns has been noticed, as well. Due to our opinion, the first world countries have been planning and developing BC technology, while the third world countries need to invest more time and money in acquiring knowledge in this technology and respected organizational changes to become credible to determine the right directions for implementing this technology rationally, to protect their national interests, and ensure sustainable development. In this regard, closer communication with developers of this technology would be necessary, as well as exploring needs and preferences of the developing environments, more rigorously, longitudinally, and through larger polls.

Limitations and Recommendations

Since we collected only 20 survey responses, further research should include in-depth interviews or a survey upon a larger poll of experts and deeper discussion on the respondents' assessments, comments, and suggestions. In addition, following investigations in the field should include experts from other developing and transitional countries (besides Montenegro and South Africa), including longitudinal studies, too. The majority of consulted respondents are not familiar with botnets, how they can affect BC, and how such attacks can be prevented. Few are familiar with stablecoin, computational power, and nodes compatibility issues. Therefore, further investigations, building new, and transferring existing knowledge, primarily on BC technological, and then on political, economic, social, environmental, and legal dimensions are needed in developing countries.

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References

1. Azzi, R.; Chamoun, R.K.; Sokhn, M. The power of a blockchain-based supply chain. *Comput. Ind. Eng.* **2019**, *135*, 582–592. [CrossRef]
2. Christidis, K.; Devetsikiotis, M. Blockchains and smart contracts for the internet of things. *IEEE Access* **2016**, *4*, 2293–2303. [CrossRef]
3. Drljevic, N.; Aranda, D.A.; Stantchev, V. Perspectives on risks and standards that affect the requirements engineering of blockchain technology. *Comput. Stand. Interfaces* **2020**, *69*, 103409. [CrossRef]
4. Davidson, S.; De, F.P.; Potts, J. Blockchains and the economic institutions of capitalism. *J. Inst. Econ.* **2018**, *14*, 639–658. [CrossRef]
5. Upadhyay, N. Demystifying blockchain: A critical analysis of challenges, applications and opportunities. *Int. J. Inf. Manag.* **2020**, *54*, 102120. [CrossRef]

6. Rao, A.R.; Clarke, D. Perspectives on emerging directions in using IoT devices in blockchain applications. *Internet Things* **2019**, *10*, 100079. [CrossRef]
7. Muckstadt, J.; Murray, D.; Rappold, J.; Collins, D. Guideliness for collaborative supply chain system design and operation. *Inf. Syst. Front.* **2001**, *3*, 427–453. [CrossRef]
8. Jang, C.-S. Maritime shipping digitalization: Blockchain-based technology applications, future improvements, and intention to use. *Transp. Part E* **2019**, *131*, 108–117.
9. Liu, J.; Zhang, H.; Zhen, L. Blockchain technology in maritime supply chains: Applications, architecture and challenges. *Int. J. Prod. Res.* **2021**. [CrossRef]
10. Tsiulin, S.; Reinau, K.H.; Hilmola, O.-P.; Goryaev, N.; Karam, A. Blockchain-based applications in shipping and port management: A literature review towards defining key conceptual frameworks. *Rev. Int. Bus.* **2020**, *30*, 201–224.
11. Zhou, Y.; Soh, Y.S.; Loh, H.S.; Yuen, K.F. The key challenges and critical success factors of blockchain implementation: Policy implications for Singapore's maritime industry. *Mar. Policy* **2020**, *122*, 104265. [CrossRef] [PubMed]
12. Trust in Trade: Announcing a New Blockchain Partner. Available online: https://www.ibm.com/blogs/blockchain/2017/03/trust-trade-announcing-new-blockchain-partner/ (accessed on 30 August 2021).
13. Blockchain and the Maritime Industry. Available online: https://www.youtube.com/watch?v=6KuXy1Ov2yM (accessed on 30 August 2021).
14. Canada's First Commercial Blockchain Service Could Become the 'Interac' for Digital Transactions. Available online: https://securekey.com/securekey_spotlight/canadas-first-commercial-blockchain-service-become-interac-digital-transactions/ (accessed on 30 August 2021).
15. TradeLens Connects Global Supply Chains. Available online: https://www.maersk.com/local-information/west-central-asia/india/local-solutions/tradelens-connects (accessed on 29 October 2021).
16. TradeLens: Solution Brief—Edition Two. Available online: https://www.maersk.com/~{}/media_sc9/maersk/local-information/files/west-central-asia/india/tradelens-solution-brief.pdf (accessed on 29 October 2021).
17. TradeLens: Solution Brief—Edition Three. Available online: https://s3.us.cloud-object-storage.appdomain.cloud/tradelens-web-assets/Tradelens_Solution_Brief_v3.pdf (accessed on 29 October 2021).
18. Shipping in the Age of Blockchain. Available online: https://www.youtube.com/watch?v=Xwqo_fwPEJo&t=1499s (accessed on 31 August 2021).
19. Rogers, E.M. *Diffusion of Innovation*, 5th ed.; Free Press: New York, NY, USA, 2003.
20. Lee, S.; Kim, K.J. Factors affecting the implementation success of Internet based information systems. *Comput. Hum. Behav.* **2007**, *23*, 1853–1880. [CrossRef]
21. Kapoor, K.K.; Dwivedi, Y.K.; Williams, M.D. Innovation adoption attributes: A review and synthesis of research findings. *Eur. J. Innov. Manag.* **2014**, *17*, 327–348. [CrossRef]
22. Kapoor, K.K.; Dwivedi, Y.K.; Williams, M.D. Rogers' innovation adoption attributes: A systematic review and synthesis of existing research. *Innov. Syst. Manag.* **2014**, *31*, 74–91. [CrossRef]
23. Kim, H.M.; Laskowski, M. Towards greater integration of insights from organization theory and supply chain management. *J. Oper. Manag.* **2018**, *25*, 455–458.
24. Kapidani, N.; Bauk, S.; Davidson, I.E. Digitalization in Developing Maritime Business Environments towards Ensuring Sustainability. *Sustainability* **2020**, *12*, 9235. [CrossRef]
25. Sakaran, U.; Bougie, R. *Research Methods for Business*, 6th ed.; Wiley: Chichester, UK, 2016; pp. 142–165.