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[1]*DUISENBIYEV A., [1]SEITKAZIEVA A., [2]ALI CEM KUZU
[1]Kazakh-British Technical University, 050000, Almaty, Kazakhstan
[2]Marine Training Academy «Lerus», Istanbul, Turkiye
*E-mail: a.duisenbiev@kbtu.kz

DIGITALIZATION OF CERTIFICATION PROCESSES AS A FACTOR IN IMPROVING MANAGEMENT EFFICIENCY IN THE MARITIME INDUSTRY

Abstract

This article discusses the implementation of digitalization as a factor in improving management efficiency in the maritime industry, with a special focus on the certification process. The study includes a literature review, analysis of studies and reports by foreign scholars, as well as expert interviews and surveys of professionals. There are many studies on the implementation of digitalization in different areas of the world economy. Western European countries in general pay serious attention to the problems of digitalization, in the maritime industry the leaders in studying and solving the problems of digitalization are Denmark and Singapore. However, for the maritime industry of Kazakhstan, due to its "youth", the study of the problems of digitalization and its impact on improving the efficiency of management decisions and reducing costs in production has the character of scientific novelty. As the maritime industry evolves, digitalization offers new opportunities to improve management practices and outcomes. One area where digitalization can have a significant impact is in the certification process. Overall, the article highlights the potential of digitalization to improve management practices and outcomes in the maritime industry. Real-life case studies from overseas companies are provided to illustrate how these technologies can be used to improve results and remain competitive in the maritime industry. The ideas and recommendations presented in this study can help shipping companies to optimize certification processes and improve operational efficiency. The article concludes by emphasizing the importance of staying abreast of the latest digital developments and incorporating these tools into the decision-making process.

Key words: management effectiveness, innovation, digitalization, transformation, maritime industry.

Introduction

The pace of globalization is increasing in all areas of the world economy, according to UNCTAD (2019) maritime transport provides transportation for up to 80% of world trade [1]. Maritime transportation is considered the most cost-effective in terms of cost-volume-speed ratio and for this reason still retains its strategic importance. However, maritime operations are complex as merchant ships transport cargo between different jurisdictions, involve multiple parties, a huge volume of transportation documents, require compliance with international maritime legislation and insurance terms. To increase efficiency and reduce costs, the maritime industry needs to introduce new

technologies. The main innovation trends today are undoubtedly Artificial Intelligence (AI), Maritime Autonomous Ships (MAS) and digitalization. The aim of this study focuses on the question: how the digitalization of certification processes can improve the efficiency of maritime transport management.

Technological progress over the previous hundred years has radically changed the maritime industry, especially a big step was made in the field of digital technologies - most modern ships are equipped with electronic chart and information display systems (ECDIS), radio detection and ranging systems (RADAR-SARP), automated identification systems (AIS) global positioning system (GPS), shipboard personal computers (PCs) and other electronic devices [2]. However, despite the significant development of digital technologies in recent decades, the methods of working in certification remain unchanged. Historically, the maritime industry has developed a system of verification and certification that involves authorized organizations issuing paper certificates with official seals and stamps. This part of the process is problematic: paper documents are susceptible to damage, loss and forgery, the volume of paperwork is so large that it is environmentally damaging (more than 65 billion sheets of paper are used every day in various areas of the world, a significant proportion of them on board merchant ships [3]. Due to the international and cross-border nature of maritime business, trade and transaction procedures can be complex and time-consuming. A significant number of documents must be generated during operations, including, inter alia, cargo insurance documents, purchase orders, shipping and loading orders, bills of lading, commercial invoices and personal documents of the ship's crew. The storage, transaction and management of these documents require human resources and can even delay ship's departure, causing unforeseen demurrage (demurrage is a charge for countersteam time) at ports. The application of digital technologies has the potential to significantly reduce such paper-based workflows and ensure that most documents are shared, transacted, and stored efficiently and securely [4]. Digital technologies can be used to always track cargo and vessels online. Due to the international and cross-border nature of maritime logistics, the procedure of trade and transportation is complex and time-consuming. The use of digital technologies has the potential to significantly reduce this paper-based workflow and enable efficient and secure sharing, transaction, and storage of most documents. International terminal operators, shipping company management, freight forwarders and shippers could create an efficient system based on blockchain technology by establishing a common control system for maritime operations. This technology can provide fast, transparent access to all necessary information with security and reliability in mind. Considering the benefits that digitalization, including blockchain technology, can bring to the maritime industry, it is necessary to consider, and analyze the factors that facilitate their implementation, as well as the obstacles in this process. The purpose of this paper is to analyze the key challenges of the digitalization of certification processes in the maritime industry and to empirically investigate the critical success factors of digitalization. As a scientific novelty of this article the authors put forward the substantiation of recommendations for solving the problems of implementation of digitalization of certification processes in the maritime industry of Kazakhstan, based on empirical results of qualitative research and based on the adaptation of foreign experience in this area.

Main provisions. Literature review

There is an extensive body of research in the scientific literature in the field of digitalization of the economy. One of the founders of the concept of digital economy is the Japanese futurologist Yoneji Masuda. According to his views, the transformation of society is the result of innovations... which in the past have always been linked to physical productivity... The current innovations in the field of social technology, however, are not related to the productivity of material goods, but to information productivity, and for this reason we can expect fundamental changes in human values, in thinking trends, in the political and economic structure of society ... [5]. C.J.Arrow in his work made an important conclusion that with the expansion of the digital economy the key point becomes the fact that probability distributions on economic variables depend on signals on other seemingly unimportant variables; in addition, this information is differently accessible to different individuals and requires resources to obtain and transmit [6]. American businessman Bill Gates writes in his book "The Road to the Future": The communications revolution is just beginning. It will stretch over

several decades and will be driven by new "applications" – new tools that meet needs that are now hard to even imagine. Over the next few years, governments, companies and individuals will have to make some big decisions. These decisions will determine both the construction of the information superhighway itself and, ultimately, its benefits. It is very important that a wide range of people, not just those involved in the debate about the future of computer technology, participate in the debate [7]. The economist Fritz Machlup [8] contributed to the foundations of the economy of wide access to knowledge, which further developed into the concept of digital economy.

It is also necessary to note the significant contribution to the development of the concept of digitalization of the economy M. Porat [9], V. Mosco [10], D. Lyon [11], T. Stonier [12], M. Castells [13]. Along with the relatively broad coverage of digitalization in the scientific literature, these studies covered mainly general economic issues. The problems of digitalization in the maritime industry, unfortunately, have not yet received proper coverage.

The authors set the aim of the study to investigate how the implementation of digitalization of certification can improve the management efficiency of the maritime industry, reduce costs, conduct an analysis of the key challenges of digitalization of certification processes in the maritime industry and an empirical study of the critical success factors of digitalization implementation.

The topic of this study has a high degree of relevance due to the importance of the maritime industry in supporting globalization and world trade [1] and improving management practices and outcomes in this industry can have a significant impact on the world economy. Secondly, the certification process is one of the most important aspects of maritime industry management as it ensures that ships comply with international safety and environmental standards. Historically, the process has been paper-based, time-consuming and error-prone. Digitizing this process allows for greater efficiency, reduced costs, and improved safety. Finally, digitalization is a key trend in many industries, and the maritime industry cannot afford to be left behind. By adopting digital technologies and incorporating these tools into their operations, companies in the maritime industry can stay competitive and ensure their long-term success. The maritime industry is a complex and highly regulated sector of the economy, requiring strict adherence to international safety and environmental standards set by the conventions of the International Maritime Organization (IMO). The certification process is one of the most important aspects of maritime transportation management, as it ensures that ships' crews meet these standards and that they operate safely. The STCW Convention 1978 was the first document to establish basic requirements for the training, certification and watchkeeping of seafarers at the international level. Previously, standards for the training, certification and watchkeeping of officers were set by individual governments, usually without regard to the practices of other countries. As a result, standards and procedures varied widely from country to country, even though shipping is the most international of all industries [14]. The Convention sets minimum standards for the training, certification and watchkeeping of seafarers that countries are required to meet or exceed. A merchant marine officer always carries with him many certificates and documents that are proof of the seafarer's qualifications and training. These certificates must be handed over to the Master on entry into service and ready for inspection by the authorities.

Listed below are some of the certificates that seafarers should always carry with them, but are not limited to them/

Table 1 – List of deck officer certificates

№	Certificate
1	Certificate of Competence (COC)
2	Basic Safety Training
3	Crisis Management and Human Behavior
4	Medical Certificate of Fitness
5	Radio Detection and Ranging (RADAR) at operational level
6	RADAR at management level
7	Electronic Chart and Display Information System (ECDIS)

Continuation of table 1

8	Advanced firefighting training
9	Lifeboat and rescue boat
10	Oil Tanker course (basic level)
11	Oil Tanker Course (advanced level)
12	Bridge Resource Management (BRM) Course
13	Global Maritime Safety Safety System (GMDSS)
14	Passenger safety
15	Cargo Security and Hull Integrity
16	Fast lifeboat handling
17	Life raft and lifeboat management (other than fast lifeboats)
18	Engine Room Resource Management (ERM)
19	Medical Training / First Aid Course
20	Designated Safety Duties (DSD)
21	High Voltage Equipment Course
22	Basic LPG tanker training
23	Advanced training in cargo operations on LPG tankers
24	Ship Security Officer (SSO)
25	Safety Awareness Course

Without presenting the above-mentioned certificates (in paper form) the officer's stay on board the vessel is not allowed, every inspection of the vessel when entering the port starts with checking the certification of the vessel's crew and the absence of official documents may entail negative consequences. It is obvious that in various life conditions (flights, change of residence, etc.) paper form of certificates may be damaged or lost. The International Maritime Organization in view of this fact in Regulation 5 of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) 1978 (Verification of Certificates of Competence and Endorsements) requires Maritime Administration (hereinafter referred to as MA) of countries to take the following steps (IMO, 2011):

1. Establish electronic databases to verify the authenticity and validity of certificates of competence and endorsements.

2. To respond promptly to requests from other administrations for verification, validity, and authenticity of safety certificates.

Thus, at the international level, the need to create a digital database at the level of Maritime Administrations of states is confirmed. Work in this direction is carried out by each country separately and at different speeds, to limit ourselves only to the creation of a digital database of certification would be only half of the solution of the problem. There is a need to transition to electronic certificates linked to cloud-based databases that would be available at anytime and anywhere in the world. One of the first steps in this direction is made by the Danish Maritime Administration [15].

At the first stage only, Danish citizens will have access to the service, but in the future coverage of foreign seafarers will be realized for all vessels flying the Danish flag. Analyzing the results of the Danish Maritime Administration's experience has shown that digital technologies and solutions increase the competitiveness and efficiency of the maritime industry. However, a complex and extensive infrastructure is required to ensure optimal performance, sustainable operation, and remote management:

- Information Technology Systems Integration.
- Data management and cybersecurity system.
- Automated remote monitoring and control.
- Resilient satellite communications.

- Mobile applications and connectivity.
- Cloud resources, data sharing and analysis.
- Unified database standard (protocol) [16].

There are requirements for vessel crew members according to the Law of the Republic of Kazakhstan "On Merchant Shipping " [17]:

- Persons having COC, confirmations of COC, certificates of training of maritime transport specialists, medical reports are allowed to occupy positions of vessel crew members.
- COC, confirmations of professional diplomas, preferential permits are issued by the seaport Maritime Administration.
- Certificates of training of specialists of maritime transport are issued by educational organizations engaged in training (retraining) and advanced training of specialists of maritime transport, maritime training, and simulator centers [17].

Kazakhstan Maritime Academy of Kazakh-British Technical University, as an internationally accredited educational institution, issues certificates to graduates of the Academy. The university keeps strict records of issued certificates, but this does not mean that failure in the work of this system is impossible. The optimal mode of operation of the certification system would be the digitalization of the entire system into a single database. Educational institutions as an integral part of the country's economy should follow the decisions of the country's government, implement digitalization processes by optimizing paperwork, applying international standards [18].

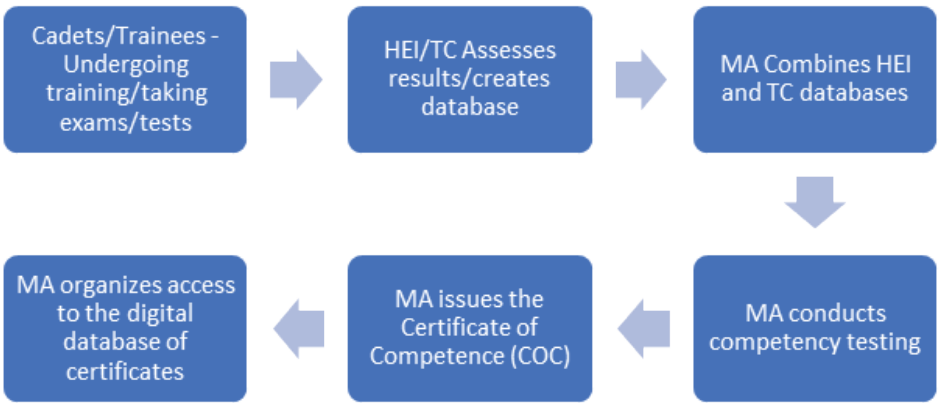

Figure 1 – Structure of the digital certification system

The authors propose to make a proposal to create a digital certification system. All work and responsibility for issuance, authentication of certificates, and electronic access to them would be included in the responsibilities of the Maritime Administration of Kazakhstan (MA RK) as a structural unit of the Ministry of Industrialization and Innovative Development of the RK (MIDI RK).

The creation of such a structure would reduce certification delays, make the whole process transparent and facilitate access to documents for companies, seafarers, and port services. The authors see the technological part of the task, the software of the process, as already tested in the system of the Electronic Government of the RK (e-gov), which has already proved itself as a reliable resource in the aspect of ensuring the security of digital signatures, two-component methods of identity verification and other technologies. Considering the best practices of the Danish Maritime Administration and e-gov, we can confidently state that there is an actual need and technological solution of this problem.

Materials and methods of research

In this study, the authors applied both qualitative and quantitative methods. In order to investigate the opinion of specialists, two target groups of maritime industry professionals were selected as interviewees: for quantitative analysis, a focus group of graduates of the Kazakhstan Maritime

Academy 2016–2020 who directly work in the maritime industry was used; for expert interviews, working contacts of authors in the maritime industry from the Kingdom of the Netherlands, Republic of Turkey, the Sultanate of Oman, and Kazakhstan were used. The small number in the sample is compensated for by the quality of the interviewees, all of whom are deeply involved in the maritime industry, well-informed about the issues, and have some professional experience. The interviews were conducted using modern methods of communication: for qualitative interviewing we used the methodology of expert assessments outlined in "The Course of Lectures on General Sociology" at Moscow State University [19] and Lissie Hoover's article [20]. E-mail addresses of the interviewed specialists were used for remote interviews and WhatsApp messenger were used for the quantitative survey.

One participant was interviewed by phone, as he was in Aktau, Kazakhstan, and three participants were interviewed in person (they were colleagues from KMA).

The preamble of the survey stated the purpose of the survey to be conducted, the scope of the subject matter and confidentiality. The expert interview and focus group surveys were conducted between August 21 and August 26, 2023.

Profile of interviewees: the interviewees were professionals who have experience in the maritime industry in various positions with experience ranging from 4 to 30 years, including experience in education. Among them 3 people headed educational structures in the Maritime Academy and Maritime Training Center, one is the CEO of a company in the field of human resources management in the global maritime industry, and 3 have teaching experience in the Maritime Academy.

All interviewed maritime industry professionals were asked the following questions:

1. What is your experience in the maritime industry and what is your current position? The answer to this question provides the authors with an understanding of the respondent's professional involvement in maritime industry issues.

2. How do you feel about the digitalization of the certification process in the maritime industry? The results of answers to this question will determine the degree of feasibility of introducing digitalization of the certification process in the maritime industry of Kazakhstan

3. Do you think it is necessary to implement the achievements of the digital revolution in the maritime industry? The statement of this question is caused by the need to determine the current trends in the development of the maritime industry of our country.

4. How can the digitalization of diplomas and certificates help the captain, shipowner, port authorities to verify the authenticity of the credentials? The answers to this question will allow to determine the ways of solving the problems of implementation of digitalization of certification processes at different levels of management hierarchy of the maritime industry of Kazakhstan.

5. What problems do you see in the implementation of digitalization of the process of issuing diplomas and certificates for seafarers? The justification of the necessity to raise this issue is due to the fact that it will allow to identify the existing problems in the process of digitalization of certification of maritime professionals.

6. What potential threats do you see in the digitalization of seafarers' diplomas and certificates? (cybersecurity? privacy?). The answers to this question will provide the authors with different perspectives from the maritime industry on the existing risks of implementing the digitalization of certification processes.

Thus, the interview questions were selected by the authors in order to find out the level of professional involvement in the maritime industry, their attitude to the issue of digitalization of certification processes and identification of "bottlenecks" of this process, which may not be obvious, but are important. Working directly in the maritime industry, the informants encounter the practical aspects of the certification process, see the administrative, regulatory and educational problems from the inside. Along with the obvious positive impact of digitalization, the questions were structured to identify potential threats to the stable operation of the industry.

When developing the interview methodology, the authors were based on the works of domestic and foreign authors [19, 20].

Interview results

All interviewees support the need for digitalization of the certification process in the maritime industry. They point out such advantages of implementing digitalization as:

- reduction of time and accessibility of certification.
- in the conditions of technological sophistication and globalization, solving issues online.
- digitalization of the certification process is a significant step in the development of the industry, contributing to the efficiency, transparency and safety of processes related to the issuance and confirmation of seafarers' qualifications.
- The use of modern digital technologies allows to reduce the time spent on verification and authenticity of certificates, as well as minimize the risks of forgery and fraud.

Answering the question "How can digitalization of diplomas and certificates help the master, shipowner and port authorities to verify the authenticity of documents?", the following was noted:

- the administrative burden is reduced substantially, and all industry shareholders will get rid of "paperwork";
- with the creation of a digital portfolio and document authentication services, it will be fast and reliable. Digitalization will simplify the life of the honest ordinary seafarer, as well as the senior staff of ships and the management of maritime companies. If, by entering some data of a person, it will be possible to see more and more active and accredited certificates of the employee, which can significantly speed up the process of hiring seafarers and further monitoring of their compliance with the minimum requirements. If online certification is connected to this, a significant amount of time and money can be saved.
- digitalization of seafarers' COC and certificates facilitates the verification of authenticity and relevance of the certificates, speeds up the processes of registration and verification of personnel qualifications, minimizes the risks of receiving false data. This helps to improve maritime safety, reduce bureaucratic costs and improve interaction between different parties in the industry.
- all certificates and diplomas will be stored in a database, eliminating the need for paper copies, reducing the risk of damaging, or losing the same documents, which will take longer later. The verification process will take much less time, saving ships time in port. It is possible to merge databases with other maritime authorities. It may be possible to receive notifications when certificates are about to expire. It may even be possible to renew certificates while on the ship (remotely).

At the same time, it is noted that:

- although the IMO is working on this, things are slow. It is unbelievable that seafarers still have to take all their certificates and diplomas with them when they sail around the world.
- the security and data privacy aspects of such projects need to be carefully considered.
- digital certification and similar applications should certainly be under the control of governments and authorized bodies. In fact, if the infrastructure of a digital certification system is well prepared, it cannot be avoided that it will be more secure and easily monitored than paper-based certificates.

Interviewees pay attention to the fact that all certifications and similar updates should certainly be supported by highly accessible and practical technological support. In this regard, the introduction of the advances of the digital revolution into the maritime industry is supported by all interviewees since:

- the maritime industry needs to be acutely aware of and keep pace with developments in digital technology.
- digitalization is inevitable in our era, and it must be implemented in the maritime industry;
- digitalization is a natural process, inevitable due to the development of technology and many training centers and educational institutions are already successfully applying it in one way or another.
- The use of digital technologies helps optimize operations at sea and on land, improves decision-making, reduces human error risks and enhances interaction between different industry players. E-certification, digital platforms for data exchange, automated control and monitoring systems contribute to more efficient and safer offshore operations.

◆ contributes to increased efficiency, productivity, safety; real data (weather, emissions, routes, vessel condition); compliance with international regulations; and of course, improved logistics.

Among the main challenges of implementing digitalization of the diploma and certificate process for seafarers, interviewees highlighted:

◆ in some countries there are still no conditions to verify the relevant certificates and qualifications of seafarers and there is evidence of the sale of diplomas and certificates of maritime professionals, which reduces the credibility of seafarers' documents. Fake agencies may appear, which will fraudulently extort money for false certification.

◆ poor service development (includes insufficient server capacity, unfinished or inconvenient web pages, inadequate updating of information on the website);

◆ vulnerability to outside interference, as many educational institutions will have access to the service, and of course the vulnerability of the system to hacker attacks.

In their responses to the questions, interviewees also made suggestions to address these challenges of digitalizing the certification process:

◆ the reliability and technological infrastructure of the respective institution of each country is important; first of all, it is necessary to provide a reliable and secure digital infrastructure to prevent unauthorized access to data and the issuance of forged credentials.

◆ if standardization according to the STCW convention is achieved, there will be no problem; in addition, compliance with new standards and regulations must be ensured, and staff must be supported and trained to use the new technologies effectively.

◆ large amounts of funding are likely to be required.

Interviewees highlight potential threats in the digitalization of seafarers' diplomas and certificates related to cybersecurity and privacy, namely:

◆ high likelihood of personal accounts being hacked, documents being forged, confidential information being "leaked";

◆ a possible "cyber-attack" could create problems in the future.

◆ technical failures in the system, which may increase inspection time, thereby increasing vessel arrival time.

◆ non-compliance with international standards.

Preventing such threats requires strict adherence to security measures, including data encryption, multi-level authentication and regular audits of the system for vulnerabilities. In this regard, the main task of countries' ministries of maritime affairs is to bring the standards, especially the training of the country's seafarers, up to international standards and to pay the utmost attention to obtaining and continuously monitoring certification and qualifications. At the head of these standards is a system based on trust. This will help the seafarers of the countries concerned to participate in important international companies and to take a respected place in the industry.

Twenty-four KMA graduates working in the maritime industry participated in the quantitative survey. The survey used the methodology described in the article "Qualitative vs. Quantitative Research Differences, Examples & Methods" by Raimo Strefkerk [21]. Through the messenger WhatsApp, all of them were asked closed-ended questions with multiple choice answers:

1. Your position in the industry
2. Your length of service?
3. How do you feel about the digitalization process in the maritime industry?
4. Have you been personally involved in the digitalization process?
5. How can the digitalization of seafarers' certificates affect the company's operations?
6. Can digitalization improve document security?
7. Can digitalization improve the cyber security of a maritime company?
8. Can digitalization of certificates improve the efficiency of Port Services, inspections?
9. Will the introduction of digitalization of certificates reduce paper workflow?
10. What problems hinder the implementation of digitalization?

Here are the results of the surveys.

1. All respondents have up to 3 years of work experience.

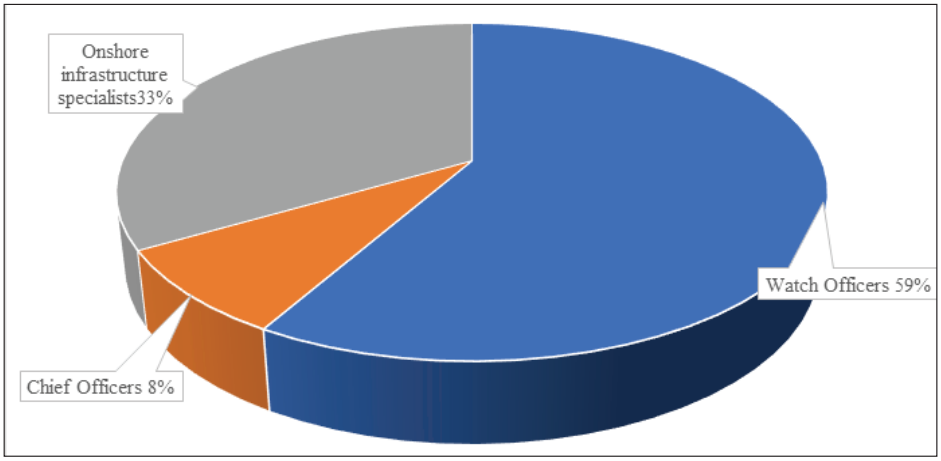

Figure 1 –The qualitative profile of respondents

2. The results of the surveys show that all respondents have a positive attitude towards the need to implement digitalization processes in the maritime industry. A more detailed analysis of the survey results showed that:

- Despite the existing risks of implementing digitalization of certification processes related to cybersecurity and privacy, 100% of respondents believe that digitalization of certificates will increase the efficiency of port services and inspections;100% of respondents believe that implementation of digitalization of certificates will reduce paperwork.
- 91.7% of respondents believe that digitalization will help to improve document security.
- 52.6% of respondents believe that digitalization of seafarers' certificates will "reduce the workload of the crew"; 47.4% believe that digitalization will "increase the efficiency of the company";

Regarding the positive impact of digitalization on maritime company cybersecurity, 58.3% of respondents answered in the affirmative, 33.4% "have no idea" and 8.3% answered "no".

Thus, even though maritime industry professionals generally support the need to implement digitalization processes, there are views that indicate a lack of awareness of the effectiveness of digitalization. This conclusion is supported by the fact that almost all respondents (95.8%) were not personally involved in the digitalization process.

3. One of the objectives of the survey was to identify the challenges of digitalization in the maritime industry. The survey showed that 38.5% of the respondents mentioned "low level of computer literacy in the industry", 34.6% – "high cost of digital technologies", 26.9% – "technological problems with implementation" as the main problem hindering the implementation of digitalization. Consequently, it can be concluded that the success of the implementation of digitalization in the maritime industry will largely depend on how active the activities in the field of professional development of specialists in this industry to address the problems of digitalization will be.

Results and Discussions

The results of the study were discussed at the meeting of the Kazakhstan Maritime Academy of KBTU on August 22, 2023. Having analyzed the information from both qualitative interviews and quantitative surveys, which were conducted using modern means of communication the authors made the following conclusions:

The majority of interviewees noted such positive aspects as increased transparency and openness of the certification process; online availability of all documents; no need to keep paper forms of documents with you; the process of ship inspection in ports will be accelerated and simplified, will have the character of a simple digital verification.

The process of digitalization today is an urgent requirement of the time, Kazakhstan is already taking an active part: Kazakhstan ranked 28th in the level of e-government development among 193 countries in the UN monitoring, against 29th place in 2020. The country's E-Government Development Index (EGDI) amounted to 0.86 points. This is the highest index among the CIS and Central Asia

countries, in addition, Kazakhstan significantly overtakes such developed countries as Ireland, Canada, Italy, Belgium, Czech Republic and others [22].

The industry faces the important task of changing some of the provisions of the STCW Convention and beyond, organizing training for all staff in digital literacy, and systematic digital skills development.

Digital technologies introduced in the certification process should be standardized, duplicated, securely protected, and systematically updated. In this way, data security problems, the risk of cyber-attacks, unauthorized access and database hacking can be avoided.

Some maritime companies have additional designated officer on their vessels, so-called Clerk, who are only responsible for documenting the crew. This solution absolutely does not meet the financial interests of the companies, does not increase the efficiency and reliability of work with documents, and is completely contrary to modern trends in the industry.

Challenges to implementing digitalization include the need for changes to IMO documents with international validation; cybersecurity is a complex task requiring significant effort; energy resources and continuous operation are required to support computer systems on board ships; the high cost of software is also an obstacle for emerging economies; training institutions and training centers should have a stable connection with the flag Maritime Administration and their databases as a backup system [23].

Conclusion

Thus, based on the analysis of the results of empirical research in the maritime industry of Kazakhstan and a review of foreign experience in the field of digitalization of certification processes in the maritime industry, the authors came to the following conclusions and recommendations that have the character of scientific novelty:

Digitalization of the certification process has wide support in the professional environment, as it can have a positive impact on the maritime industry, increase the availability of documents for the command staff of ships, port administration, the process of registration of documents will become more transparent;

For the maritime industry of Kazakhstan there is an opportunity to learn from the experience of advanced countries in the field of digitalization of the certification process in the maritime industry, such as Denmark and Singapore. The experience gained in Kazakhstan in digitalization of public services, documentation and control allows to implement this project at the level of the Maritime Administration of Ports of the Republic of Kazakhstan;

However, it should be taken into account that the maritime industry has its own peculiarities, which consist in the international nature of maritime transportation, international composition of ship crews, the need to operate in several jurisdictions in one voyage. Standards and regulations in the maritime industry are set by consensus by decisions of the International Maritime Organization.

The most important factor for the success of digitalization is to ensure the reliability of the operation and protection of the electronic document management system at all parts of the process: in the university, in the Maritime Port Authority, in port administrations and on merchant ships;

To reap the benefits of digitalization, the maritime industry is advised to adopt good practices such as investing in reliable and secure digital platforms, providing adequate training and support to stakeholders, and regularly assessing and updating digital systems to ensure they meet industry standards and requirements.

The authors believe that the findings from the data obtained can be considered as relevant as the participants in the interviews and surveys were maritime professionals from the Sultanate of Oman, the Netherlands, Turkey and Kazakhstan who have real experience in the maritime industry and maritime education.

However, it is important to recognize the limitations of the study. To fully understand the potential challenges and risks associated with the digitalization of certification processes in the maritime industry, further research and practical projects in the real sector involving IT, human resource management and financial management professionals are needed. In addition, security and privacy aspects need to be considered when implementing digital solutions. The topic of digitalization in the maritime industry is waiting for researchers and the authors hope that this paper will be a good start for further research.

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[1]*ДУЙСЕНБИЕВ А., [1]СЕЙТКАЗИЕВА А., [2]АЛИ ЖЕМ КУЗУ
[1]Қазақстан-Британ техникалық университеті, 050000, Алматы қ., Қазақстан
[2]«Лерус» теңізді оқыту академиясы, Ыстанбұл қ., Түркия
*E-mail: a.duisenbiev@kbtu.kz

ТЕҢІЗ ӨНЕРКӘСІБІНДЕГІ БАСҚАРУ ТИІМДІЛІГІН АРТТЫРУ ФАКТОРЫ РЕТІНДЕ СЕРТИФИКАТТАУ ПРОЦЕСТЕРІН ЦИФРЛАНДЫРУ

Аңдатпа

Бұл мақаланың тақырыбы – сертификаттау процесіне баса назар аудара отырып, теңіз индустриясында басқару тиімділігін арттыру факторы ретінде цифрландыруды енгізу. Зерттеу әдістемесі шетелдік ғалымдардың зерттеулері мен баяндамаларына, шетелдік әдебиеттерге шолу мен мамандардың сараптамалық сұхбаттарынан, сауалнамаларынан тұрады. Зерттеудің ғылыми жаңалығы цифрландыруды енгізу мәселелерін және оның Қазақстанның теңіз өнеркәсібінде басқару шешімдерінің тиімділігін арттыруға және өндірістік шығындарды азайтуға әсерін зерттеуде жатыр. Экономиканың әртүрлі салаларында цифрландыруды енгізу бойынша көптеген зерттеулер жүргізілуде. Алайда бұл мәселені Қазақстандағы теңіз өнеркәсібінің контексті-

не қатысты зерттеуде айтарлықтай олқылық бар. Теңіз саласы дамыған сайын цифрландыру басқару әдістерін жетілдіруге және нәтижелерді жақсартуға жаңа мүмкіндіктер ашады. Цифрландырудың айтарлықтай әсері тиюі мүмкін салалардың бірі – сертификаттау процесі. Жалпы, мақала теңіз өнеркәсібіндегі басқару әдістерін жетілдіру және нәтижелерді жақсартудағы цифрландырудың әлеуетін айқындайды. Шетелдік компаниялардың тәжірибесіндегі бұл технологияларды пайдалану арқылы қалай нәтижелерді жақсартып, теңіз өнеркәсібіндегі бәсекеге қабілеттілікті сақтап қалуды көрсететін мысалдар ұсынылған. Ұсынылған идеялар мен ұсыныстар жүк тасымалдаушы компанияларға сертификаттау процестерін оңтайландыруға және тиімділікті арттыруға көмектеседі. Мақала соңғы цифрлық әзірлемелерден хабардар болу мен бұл құралдарды шешім қабылдау процесіне енгізу маңызды деп қорытындыланады.

Тірек сөздер: басқару тиімділігі, инновациялар, цифрландыру, теңіз индустриясы.

[1]*ДУЙСЕНБИЕВ А., [1]СЕЙТКАЗИЕВА А., [2]АЛИ ЖЕМ КУЗУ
[1]Казахстанско-Британский технический университет, 050000, г. Алматы, Казахстан
[2]Академия морского обучения «Лерус», Стамбул, Турция
*E-mail: a.duisenbiev@kbtu.kz

ЦИФРОВИЗАЦИЯ ПРОЦЕССОВ СЕРТИФИКАЦИИ КАК ФАКТОР ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ УПРАВЛЕНИЯ В МОРСКОЙ ОТРАСЛИ

Аннотация

Предметом рассмотрения данной статьи является процесс внедрения цифровизации как фактор повышения эффективности управления в морской отрасли с акцентом на процесс сертификации. Методология исследования включает обзор литературы, исследований и отчетов зарубежных ученых, а также экспертные интервью и опросы профессионалов. Научная новизна исследования заключается в изучении проблем внедрения цифровизации и ее влияния на повышение эффективности управленческих решений и снижение затрат на производстве в морской отрасли Казахстана. В различных сферах экономики имеется множество исследований по внедрению цифровизации, однако существует значительный пробел в изучении этого вопроса в отношении контекста морской отрасли Казахстана. По мере развития морской отрасли цифровизация открывает новые возможности для совершенствования методов управления и улучшения результатов. Одной из областей, где цифровизация способна оказать существенное влияние, является процесс сертификации. В целом статья подчеркивает потенциал цифровизации для совершенствования методов управления и улучшения результатов в морской отрасли. Приводятся реальные примеры из практики зарубежных компаний, иллюстрирующие, как эти технологии могут быть использованы для улучшения результатов и сохранения конкурентоспособности в морской отрасли. Представленные идеи и рекомендации помогут судоходным компаниям оптимизировать процессы сертификации и повысить эффективность работы. В заключение статьи подчеркивается, что важно оставаться в курсе последних цифровых разработок и внедрять эти инструменты в процесс принятия решений.

Ключевые слова: эффективность управления, инновации, цифровизация, трансформация, морская индустрия.

Information about authors

Duisenbiyev Askar (corresponding author)
Captain 1st Rank (ret.), Senior Nautical Lecturer at Kazakh-British-Technical University, Almaty, Kazakhstan
ORCID ID: 0009-0005-9591-9400
E-mail: a.duisenbiev@kbtu.kz
Seitkazieva Aruzhan
Doctor of Economics, Professor, Business School of Kazakh-British Technical University, Almaty, Kazakhstan
ORCID ID: 0000-0002-0641-1498
E-mail: a.seitkaziyeva@kbtu.kz

Ali Cem Kuzu
Assoc. Professor, PhD, General Manager of the Marine Training Academy «Lerus»,
Istanbul, Turkiye
ORCID ID 0000-0001-5594-9158
E-mail: alicem@lerus-online.com

Авторлар туралы мәліметтер

Дуйсенбиев Аскар (корреспонденция авторы)
Отставкадағы 1 дәрежегі Капитан, Қазақстан теңіз академиясының аға оқытушысы,
Қазақстан-Британ техникалық университеті,
Төле би көш., 59, 050000, Алматы қ., Қазақстан.
ORCID ID: 0009-0005-9591-9400
E-mail: a.duisenbiev@kbtu.kz
Сейтказиева Аружан
Экономика ғылымдарының докторы, профессор, Бизнес-мектеп,
Қазақстан-Британ техникалық университеті,
Төле би көш., 59, 050000, Алматы қ., Қазақстан.
ORCID ID: 0000-0002-0641-1498
E-mail: a.seitkaziyeva@kbtu.kz
Али Жем Кузу
Доцент, профессор, PhD, «Лерус» теңізді оқыту академиясы, бас менеджері,
Ыстанбұл қ., Түркия
ORCID ID 0000-0001-5594-9158
E-mail: alicem@lerus-online.com

Информация об авторах

Дуйсенбиев Аскар (автор для корреспонденции)
Капитан 1-го ранга в отставке, старший преподаватель мореплавания,
Казахстанско-Британский технический университет,
ул. Толе би, 59, 050000, г. Алматы, Казахстан.
ORCID ID: 0009-0005-9591-9400
E-mail: a.duisenbiev@kbtu.kz
Сейтказиева Аружан
Доктор экономических наук, профессор, Бизнес-школа,
Казахстанско-Британский технический университет,
ул. Толе би, 59, 050000, г. Алматы, Казахстан.
ORCID ID: 0000-0002-0641-1498
E-mail: a.seitkaziyeva@kbtu.kz
Али Жем Кузу
Ассоциированный профессор, PhD, генеральный менеджер Академии морского обучения
«Лерус», г. Стамбул, Турция
ORCID ID 0000-0001-5594-9158
E-mail: alicem@lerus-online.com