



Research Article

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Solving Legal Problems of Digitalization in Production and Export of Kazakhstan Electric Vehicles and Agricultural Machines

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Abstract

The digitalization of exports is becoming increasingly important in today's globalized economy, particularly in the automotive industry. This study identified legal barriers to the digitization of electric vehicle (EV) exports from Kazakhstan, a country that has recently started producing and exporting EVs. Using a Delphi method and explorative factor analysis, the study identified electronic signature laws, intellectual property protection for EV technology, cybersecurity and data privacy regulations, and compliance with national trade agreements as the main legal barriers to the digitalization of Kazakhstan's EV exports. The findings indicate that these legal barriers are interrelated and describe one phenomenon, and they can significantly impede the digitalization of exports of EVs in Kazakhstan. This study provides policy recommendations for addressing these legal barriers to facilitate the digitalization of exports in Kazakhstan's EV industry. The study's contribution to the literature is the identification of legal barriers specific to Kazakhstan and the interrelatedness of these legal barriers, which can help policymakers develop targeted policies to support the digitalization of exports in Kazakhstan's EV industry.

Keywords: electric vehicles, digitalization, export, Kazakhstan, legal barriers

1. Introduction

Electric vehicles (EVs) have become increasingly popular in recent years as a solution to the environmental and economic challenges associated with traditional fossil fuel-powered vehicles. The

benefits of EVs include lower greenhouse gas emissions (Requia et al., 2018; Ellingsen et al., 2016), reduced reliance on imported oil (Carlsson and Johansson-Stenman, 2003), and improved air quality in urban areas (Soret et al., 2014). In addition, EVs offer lower operating costs compared to gasoline-powered vehicles due to the lower cost of electricity and the fewer moving parts in electric drivetrain (Ayodele and Mustapa, 2020). The growth of the EV market has been spurred by government policies and regulations aimed at reducing carbon emissions and promoting clean energy solutions (Kosov et al., 2017). Many countries have introduced incentives such as tax credits and subsidies to encourage the adoption of EVs (Wang et al., 2019; Breetz and Salon, 2018), while others have implemented emissions standards and other regulations to phase out the use of gasoline-powered vehicles. As a result, the global market for EVs is projected to continue to grow rapidly in the coming years (Falchetta and Noussan, 2019). However, challenges remain in terms of the infrastructure needed to support the widespread adoption of EVs as well as legal and regulatory barriers to their export and use in international trade.

Kazakhstan, as a country with vast natural resources and strategic location between Europe and Asia, can become a leading player in the automotive industry. In recent years, Kazakhstan has started to produce and assemble electric vehicles (EVs) with the aim of becoming a significant exporter in the global market. The production and export of EVs not only contributes to the diversification of Kazakhstan's economy but also helps to reduce its reliance on fossil fuels, which are a major contributor to global carbon emissions. Furthermore, the production and export of EVs can help position Kazakhstan as a leader in sustainable and innovative technology. By exporting high-quality EVs, Kazakhstan can showcase its capabilities and attract foreign investment to the country's automotive industry. The increased production and export of EVs can also create job opportunities for local citizens, which is crucial for the country's economic growth and development.

With the advancements in technology, digitalization has become a critical component for businesses to remain competitive and efficient in the global market. Kazakhstan, being an emerging economy, has realized the importance of digitalization in the export sector, particularly for the growing EV industry. The digitalization of export processes can enhance the speed and efficiency of transactions (Sanchez-Riofrio et al., 2022), improve supply chain management (Bigliardi et al., 2022), and reduce transaction costs (Shumakova, 2020), making Kazakhstani EVs more competitive in the global market. Moreover, the COVID-19 pandemic has accelerated the need for digitalization, as travel restrictions and physical distancing measures have hindered traditional face-to-face trade practices. The use of digital tools such as electronic signatures, digital platforms, and online trade systems has become increasingly important for the continuity of trade during the pandemic. Thus, the digitalization of export processes has become more relevant than ever for Kazakhstan to maintain and expand its EV export market.

The digitalization of exports is an essential part of modern trade practices that can improve the efficiency, reduce costs, and increase competitiveness. However, legal and regulatory frameworks can sometimes hinder the process of digitalization (Gromova et al., 2022), making it difficult for businesses to fully realize the benefits of digital technologies. Laws and regulations that were designed for traditional physical trade can be inadequate or even prohibitive in the context of digital trade. In addition, the fast-paced nature of technological advancements can make it challenging for policymakers to keep up with changes and adapt laws and regulations accordingly. Therefore, it is important to identify and address legal barriers to the digitalization of exports to promote a more efficient and competitive trading environment.

Despite the growing interest in the digitalization of international trade, there is still a lack of comprehensive research on the legal barriers to the digitalization of exports, particularly in the context of EVs. The digitalization of exports is a complex process that involves various legal and regulatory requirements that may hinder the adoption of new technologies such as EVs in international trade. Therefore, there is a need for research that identifies the legal barriers to the digitalization of exports and develops strategies to overcome them. This study aims to fill this gap in the literature by identifying the legal barriers to the digitalization of Kazakhstan's EV exports using

the Delphi method and exploring the relationship between these barriers using exploratory factor analysis. The objectives of this study are to (1) identify the legal barriers to the digitalization of Kazakhstan’s EV exports and (2) develop strategies to overcome these barriers and promote the digitalization of Kazakhstan’s EV exports.

2. Methodology

The current study employs a mixed-method research design. A mixed-method research design is a research approach that combines both qualitative and quantitative methods in the collection, analysis, and interpretation of data (Östlund et al., 2011). This type of research design provides a more comprehensive understanding of a research problem by drawing on the strengths of both qualitative and quantitative research methods (Creswell, 1999). The Delphi method is used to identify legal barriers to the digitization of Kazakhstan’s export of electric vehicles (EVs). The Delphi method is a structured communication technique used to elicit and aggregate the opinions of a group of experts. In this study, we invited 15 experts from institutions and organizations engaged in Kazakhstan’s EV exports to participate in the Delphi study. In the first round of the Delphi study, experts were asked to identify and rank the most important legal barriers to the digitization of Kazakhstan’s EV exports. The results of the first round were analyzed and summarized, and the top-rated barriers were presented to the experts for reevaluation to another three rounds. The results of Delphi method are then confirmed through exploratory factor analysis to ensure that the identified barriers are related and can describe one phenomenon. For this purpose, a five-point Likert scale questionnaire was designed and distributed among the employees of five institutions (i.e., Export Insurance Company, Center for Trade Policy Development, Development Bank of Kazakhstan, Entrepreneurship Development Fund, and EVs Manufacturer). It is worth mentioning that the data collection occurred from December 2022 to February 2023.

3. Results

3.1 Phase 1: Delphi method

In this study, the Delphi method was used to identify the legal barriers that hamper the digitization of the export process of EVs in Kazakhstan. The expert panel participating in this study consisted of 15 highly experienced professionals from five institutions (three experts from each institution) that are directly involved in the Kazakhstan export of EVs (i.e., Export insurance company, center for trade policy development, development bank of Kazakhstan, Entrepreneurship development fund, Company producing and exporting EVs). Most of experts were male with an average work experience of 13.5 years. The panel’s positions varied from CEOs and COOs to CTOs and CMOs, and the experts had extensive knowledge in international trade, technology, marketing, and management. Their diverse backgrounds provided a comprehensive perspective on the legal barriers to the digitalization of Kazakhstan’s EV exports. Table 1 shows the demographic information of this panel of experts participating in this study.

Table 1: Expert Panel Demographics

Experts	Position	Sector	Work Experience	Gender
Expert 1	The Chief Executive Officer (CEO)	Export Insurance Company	15	Male
Expert 2	The Chief Sales Officer (CSO)	Export Insurance Company	16	Male
Expert 3	Sales Manager	Export Insurance Company	10	Female
Expert 4	The Chief Executive Officer (CEO)	Center for Trade Policy Development	19	Male
Expert 5	The Chief Technology Officer (CTO)	Center for Trade Policy Development	16	Female

Experts	Position	Sector	Work Experience	Gender
Expert 6	Deputy Chief Executive Officer (DCEO)	Center for Trade Policy Development	12	Male
Expert 7	Branch Manager	Development Bank of Kazakhstan	15	Male
Expert 8	Deputy Branch Manager	Development Bank of Kazakhstan	15	Female
Expert 9	Deputy Director of Information Technology	Development Bank of Kazakhstan	9	Male
Expert 10	Vice President of Business Development	Entrepreneurship Development Fund	17	Male
Expert 11	The Chief Operating Officer (COO)	Entrepreneurship Development Fund	17	Male
Expert 12	The Chief Marketing Officer (CMO)	Entrepreneurship Development Fund	9	Female
Expert 13	Deputy Chief Executive Officer (CEO)	EVs Manufacturer	9	Male
Expert 14	Deputy Chief Marketing Officer (CMO)	EVs Manufacturer	13	Female
Expert 15	Deputy Chief Operating Officer (COO)	EVs Manufacturer	11	Male

Source: authors' original work

The identification of legal barriers to digitization of exports was done in 4 stages, where in the first stage unstructured interviews were conducted with experts and during this interview; they were asked to name these legal barriers. In the second, third and fourth stages, the legal barriers identified in the previous stage were provided to the experts in the form of a list and they were asked to choose the most important ones. This process took three stages, so that the entire Delphi process became 4 stages (see figure 1). Note that all the interview sessions with the panel members were conducted face-to-face and one-on-one, and the panel members were anonymous (that is, the panel members did not know each other's identity) and one of the authors of the present study always guided the Delphi process.

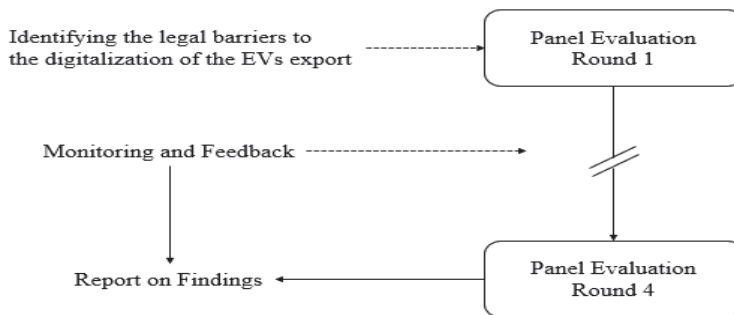


Figure 1: Delphi Method Process Used in This Study

Source: authors' original design

In the fourth stage of the Delphi process, all the experts reached a consensus on the four main legal barriers to the digitalization of EVs export process in Kazakhstan: electronic signature laws, intellectual property protection for EV technology, cybersecurity and data privacy regulations, and compliance with national trade agreements.

Electronic signature laws: The use of electronic signatures in trade transactions is an important aspect of digitalization. However, the absence of clear laws and regulations around electronic signatures can create uncertainty and legal risks for businesses. In the context of Kazakhstan's EV exports, unclear or inconsistent laws and regulations around electronic signatures can create barriers to digitalization.

Intellectual property protection for EV technology: Intellectual property protection is essential for fostering innovation and investment in new technologies. However, the lack of effective protection for intellectual property related to EV technology can discourage companies from investing in research and development of EV-related technology. This can hinder the growth and competitiveness of the EV industry in Kazakhstan.

Cybersecurity and data privacy regulations: As digitalization of trade and commerce increases, the risk of cyberattacks and data breaches also increases. Effective cybersecurity and data privacy regulations are necessary to protect businesses and consumers from these risks. In the context of Kazakhstan’s EV exports, the absence of clear and effective regulations around cybersecurity and data privacy can discourage businesses from embracing digitalization.

Compliance with national trade agreements: Kazakhstan is a signatory to several international trade agreements that govern the export and import of goods, including EVs. Compliance with these agreements is important for facilitating trade and avoiding legal disputes. However, the complexity of these agreements and the potential for conflicting regulations can create barriers digitalization Kazakhstan’s EV exports.

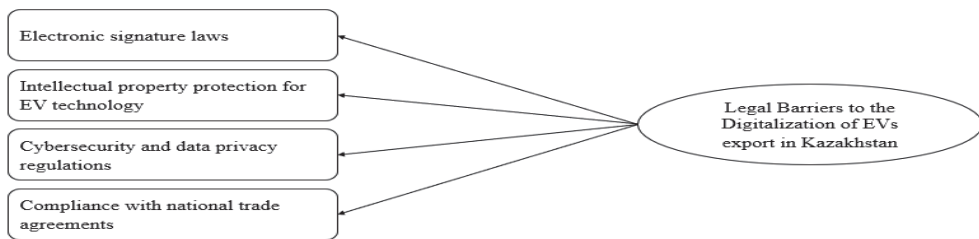


Figure 2: The proposed theoretical model of the legal barriers to digitalization of EVs export in Kazakhstan

Source: authors’ original design

3.2 Phase 2: Factor Analysis

In the second phase of this study, the proposed model was tested using exploratory factor analysis. Table 2 shows the demographic information of the participants in this phase of the study. 71 people participated in the second phase of this study, of which 54% were male and 46% were female. The majority of the experts (57%) had less than ten years of work experience in their respective fields, with the highest percentage in the Entrepreneurship Development Fund sector. The EV manufacturing sector had the highest percentage (78%) of female experts who were female.

Table 2: Demographic information of participants in the second phase of this study

		Export Insurance Company	Center for Trade Policy Development	Development Bank of Kazakhstan	Entrepreneurship Development Fund	EVs Manufacturer
The number of participants		13	9	14	17	18
Work Experience	Less than ten years	69%	67%	50%	71%	28%
	More than ten years	31%	33%	50%	29%	72%
Gender	Male	38%	78%	71%	59%	22%
	Female	62%	22%	29%	41%	78%

Source: authors’ original work

The output of the exploratory factor analysis test using SPSS software is given in Tables 5, 6, and 7. Note that the average of the values of the questions related to each variable was taken and assigned to each variable, and then an exploratory factor analysis test was conducted. Table 3 shows that the Kaiser-Meyer-Olkin (KMO) value is 0.763, which indicates that the number of participants in this survey is sufficient. On the other hand, the significance of Bartlett's coefficient (i.e., $p < 0.05$) indicates

that these four variables are correlated to one another.

Table 3: KMO and Bartlett's Test

Tests	Values	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.763	
Bartlett Test of Sphericity	Approx. Chi-Square	144.522
	df	6
	Sig.	.000

Source: authors' original work

Table 4 shows that these variables are able to explain 84.131% of the variances of a phenomenon (i.e., legal barriers to the digitization of the export of electric vehicles (EVs) in Kazakhstan).

Table 4: Total Variance Explained (*Extraction Method: Principal Component Analysis)

Component*	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.365	84.131	84.131	3.365	84.131	84.131
2	.468	11.691	95.822			
3	.158	3.944	99.766			
4	.009	.234	100.000			

Source: authors' original work

On the other hand, the result of the Principal Component Analysis test, which is also shown in Table 5, shows that these variables express a phenomenon.

Table 5: Component Matrix (* - Extraction Method: Principal Component Analysis; 1^a - component extracted)

Variables	Component*
	r ^a
Electronic signature laws	0.881
Intellectual property protection for EV technology	0.905
Cybersecurity and data privacy regulations	0.941
Compliance with national trade agreements	0.940

Source: authors' original work

4. Findings and Discussion

The study identified the legal barriers to the digitization of Kazakhstan's EV exports using the Delphi method and explorative factor analysis. The results of the Delphi method showed that electronic signature laws, intellectual property protection for EV technology, cybersecurity and data privacy regulations, and compliance with national trade agreements are the main legal barriers to the digitization of Kazakhstan's EV exports. The explorative factor analysis confirmed that these four factors describe one phenomenon of the legal barriers to the digitization of the Kazakhstan EVs export. These findings have significant implications for policymakers and businesses operating in the EV industry in Kazakhstan, as addressing these legal barriers is necessary to ensure a smooth transition toward digitalization and to enable the growth of the EV export market. Based on the

findings of this study, we propose several solutions to overcome the legal barriers to the digitization of the export of electric vehicles (EVs) in Kazakhstan:

1. **Electronic signature laws:** To overcome the legal barriers caused by electronic signature laws, the government of Kazakhstan needs to review and update its legal framework to comply with international best practices in electronic signature regulations. This will help enhance the acceptance and validity of electronic signatures and thereby facilitate the digitalization of the EV export process.
2. **Intellectual property protection for EV technology:** to address the legal barriers related to intellectual property protection, the Kazakhstani government should establish a strong legal framework for protecting the intellectual property rights of EV technology. This can be done by strengthening existing laws and regulations and by increasing awareness of the importance of intellectual property protection among EV manufacturers.
3. **Cybersecurity and data privacy regulations:** to address the legal barriers related to cybersecurity and data privacy, the government of Kazakhstan should develop and implement comprehensive cybersecurity and data privacy regulations that meet international standards. This will help to ensure the security and privacy of data transmitted during the digitalization process.
4. **Compliance with national trade agreements:** to address the legal barriers related to compliance with national trade agreements, the government of Kazakhstan should review and update its trade agreements to ensure they are compatible with international standards for electronic trade. This will help facilitate the digitalization of the export process and improve trade relations with other countries.

Overall, the solutions provided in this study support the digitalization of the Kazakhstan export of EVs by addressing the legal barriers identified in this study. By implementing these solutions, the Kazakhstani government and EV manufacturers can work toward improving the efficiency and competitiveness of the EV export process in the digital era.

4.1 *Policy Recommendations*

1. **Electronic Signature Laws:** The government of Kazakhstan should implement an electronic signature law that agrees with international standards, which would help increase the efficiency of digital transactions and improve the reliability of electronic signatures. This would remove the current legal barriers to the use of electronic signatures, thus facilitating the digitalization of EV exports.
2. **Intellectual Property Protection for EV Technology:** The government of Kazakhstan should enact laws and regulations that provide adequate protection for intellectual property related to EV technology. That would encourage innovations and technology transfers, and attract foreign investments to the country's EV industry.
3. **Cybersecurity and Data Privacy Regulations:** The government of Kazakhstan should establish robust cybersecurity and data privacy regulations that agree with international best practices to ensure that digital transactions related to EV exports are secure and that personal data is protected.
4. **Compliance with National Trade Agreements:** The government of Kazakhstan should comply with national trade agreements to facilitate the digitalization of EV exports. This includes adopting standards and regulations that agree with international best practices to reduce trade barriers and increase the efficiency of cross-border transactions.

4.2 *Recommendations for future studies*

The findings of this study provide valuable insights for future studies in the field of legal barriers to the digitalization of exports, specifically for the EV industry in Kazakhstan. First, it would be

beneficial for future studies to conduct a comparative analysis of legal barriers across different countries to determine whether the findings of this study are specific to Kazakhstan or if they are generalizable to other countries. Additionally, future studies could investigate the impact of legal barriers on different stages of the EV export process, such as production, distribution, and sales. This would help identify which stages of the process are most affected by legal barriers and inform policy decisions to address them.

Another area for future research could be the role of stakeholders in addressing legal barriers to the digitization of EV exports. Future studies could investigate the attitudes and perceptions of stakeholders such as EV manufacturers, government agencies, and consumers toward legal barriers and their willingness to address them. This would help identify potential champions and obstacles to address legal barriers and inform strategies to overcome them.

Finally, future studies could investigate the impact of technological advancements on legal barriers to the digitization of EV exports. With the rapid pace of technological change, it is important to understand how new technologies, such as blockchain and artificial intelligence, can be used to address legal barriers and facilitate the digitalization of EV exports. This would help inform policy decisions and ensure that legal frameworks pace with technological advancements.

4.3 Study Limitations

The study focused solely on the legal barriers to the digitalization of Kazakhstan's EV exports. Therefore, the findings of this study may not be generalizable to other countries or industries.

5. Conclusion

In conclusion, this study identified and analyzed legal barriers to the digitization of the Kazakhstan's export of electric vehicles (EVs). The findings imply that electronic signature laws, intellectual property protection for EV technology, cybersecurity and data privacy regulations, and compliance with national trade agreements are the main legal barriers to the digitalization of Kazakhstan's EV exports. These legal barriers can significantly hinder the development and growth of the EV industry in the country.

To address these legal barriers, it is recommended that the government and policymakers implement appropriate policies and regulations that promote the digitalization of exports while ensuring the protection of intellectual property rights, data privacy, and cybersecurity. Moreover, policymakers should consider the need for a comprehensive legal framework that governs the EV industry, including regulations that encourage the transfer of technology and the protection of intellectual property rights.

In terms of future research, this study opens up new avenues for further research on legal barriers to the digitalization of exports in other industries and regions. Additionally, further research is needed to explore the impact of legal barriers on the development and growth of the EV industry in other emerging markets. Overall, addressing the legal barriers identified in this study can lead to increased competitiveness, innovation, and growth in the EV industry in Kazakhstan, which can contribute to the country's sustainable economic development.

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