GAINS FROM INTRODUCING E-CMR BY INTERNATIONAL MANUFACTURING COMPANY

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Abstract. Transportation is an important industry of the national economy, which conveys people and goods. In Latvia, freight is mainly transported by road, with international freight transportation by road accounting for a quarter of the total. To make the processing of freight transport documentation faster and more efficient, it is important to digitalize the documents. The research focuses on the transition from a paper CMR consignment note to an electronic one (e-CMR), as permitted by the United Nations Convention on the Contract for the International Carriage of Goods by Road (CMR) and the Additional Protocol concerning the Electronic Consignment Note (e-CMR). The research aims to estimate financial and time savings, if an international company introduces e-CMR in its operation. The monographic, synthesis and analysis methods were employed to achieve the research aim. To estimate the financial and time savings, if a company introduces e-CMR, the research did a case study of an international company and performed economic calculations. It was found that the duration of processing a paper CMR consignment note was 20 minutes (EUR 6.23), while the duration of processing an e-CMR consignment note was less than 6 minutes (EUR 1.69), which means that introducing e-CMR saves a lot of time, money and human resources. An investment needed for introducing the e-CMR system is approximately EUR 27 600.

Keywords: CMR, e-CMR, logistics, transportation industry.

Introduction

Transportation is an important industry of the national economy, which conveys people and goods across the world and contributes to economic growth. According to the Central Statistical Bureau, most of the freight in Latvia was transported by road (73.8 million tonnes in 2019), of which 24% was international freight transportation by road (18 million tonnes). Although various digital improvements are introduced in the transportation industry, there are still various administrative challenges regarding documentation, incl. road freight transportation documentation. Therefore, governments work on legislative amendments to facilitate technological transformation [1].

One of the most important documents governing the international carriage of goods since 1956 is the United Nations (UN) Convention on the Contract for the International Carriage of Goods by Road (hereinafter the CMR Convention) [2], which was drawn up with the aim of creating a uniform legal framework for national and international freight transportation by road. The CMR Convention has been ratified by a number of the European Union (EU) Member States as well as a number of non-EU countries. A carrier conveying consignments use a CMR consignment note, which provides all the necessary information on the goods transported, the carrier and the consignee. The CMR consignment note not only contains accurate details about the freight but also represents a contract between the three parties involved in the shipment: the consignor, the carrier and the consignee. Any CMR consignment note is available in paper format, yet in order to ensure more efficient cooperation within the logistics chain, many countries have already advocated the transition to electronic format, as permitted by the Additional Protocol to the CMR Convention on the Electronic Consignment Note adopted on 20 February 2008 [3]. Latvia joined the protocol already in 2009, yet e-CMR has not been introduced into practice yet, as this project is currently under pilot development, and a conceptual report on the need to introduce e-CMR in Latvia has been submitted to the Ministry of Transport in 2021.

Scientific research studies on the use of CMR and e-CMR have been conducted worldwide, e.g. Lamont-Black is positive about the fact that in 1956 in Geneva the member states reached an agreement in favour of carriers, as the CMR Convention aimed to standardize the terms and conditions governing contracts for the cross-border carriage of goods [4]. Spanjaart also emphasizes that concluding an international contract of carriage would be much more difficult for the carrier itself in the absence of the CMR Convention, as the carrier would then have to be aware of all the national transport rules in the various countries [5]. Various advantages of e-CMR are also referred to [6], namely that multimodal solutions can be an advantage in attracting new investors and international carriers, as well as saving financial and time resources. Given that the number of CMR consignment notes issued by national

carriers is approximately 2 million per year, it would be possible to save up to EUR 9 million per year by introducing electronic consignment notes in the road freight transportation industry in Latvia [7].

Since e-CMR becomes a topical issue, the research analysed an international company that provided transportation services to its customers by delivering their freight within the Baltic States; therefore, it is important for the company to consider an opportunity to introduce e-CMR in its operation. The company analysed could be considered a basis for increasing the performance of similar companies through introducing e-CMR in their operation.

The research aims to estimate financial and time savings if an international company introduces e-CMR in its operation. To achieve the research aim, the following specific research tasks were set: 1) to give insight into the theoretical aspects of CMR and e-CMR; 2) to estimate financial and time savings due to the introduction of e-CMR into an international company.

Materials and methods

The monographic and descriptive methods, as well as synthesis and analysis were employed to achieve the aim and perform the tasks. To estimate financial and time savings due to the introduction of e-CMR into a company, the research analysed the relevant experience of an international manufacturing company and performed economic calculations based on the case study.

Results and discussion

Theoretical aspects of CMR and e-CMR. A CMR consignment note is an international document used by truck drivers, carriers and freight forwarders that governs the liability of the parties for the international carriage of goods by road. When the freight is delivered to the destination, the carrier sends a second copy of the note to the consignee after the delivery [8]. A CMR consignment note serves as proof of the contract of carriage, the content and applicable regime of which are stipulated in international conventions [9]. An e-CMR consignment note, however, is an electronic document issued by the consignor to the transportation service provider engaged in international road freight transportation. The business party receiving the asset (vehicle) signs the CMR note as proof that the delivery has been completed. During the delivery, the transportation company driver has this document available in the computer system on a separate tablet or smartphone. If the driver is inspected by a supervisory authority during the delivery, the digital document (e-CMR) presented by the driver is a legal document that replaces the CMR note in paper format.

Since 2008, UN countries have had an opportunity to digitalize the CMR process by introducing the electronic CMR (e-CRM) system, which has the same legal status as the paper CMR system. The use of e-CMR was officially launched only in January 2017, while in 2021 the e-CMR Protocol has been ratified by 29 countries, incl. Latvia, which means that an e-CMR note can be used as a legal document in the countries.

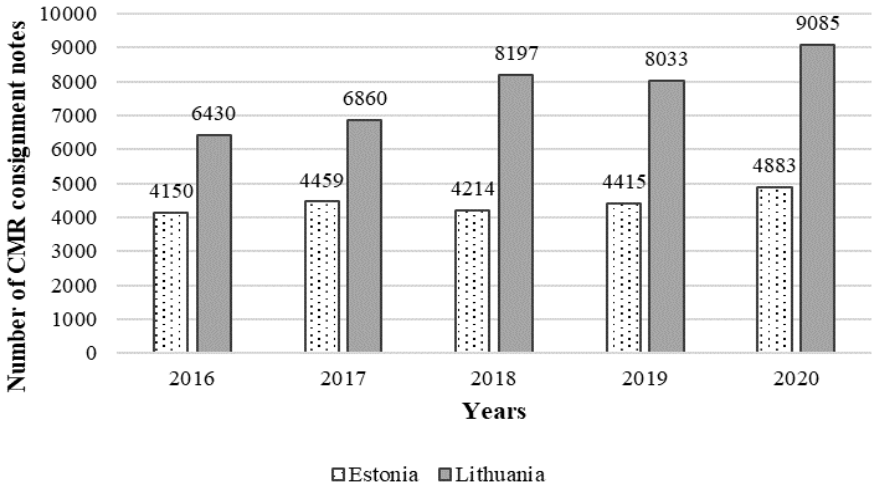
Overall, electronic CMR notes have many advantages over paper ones. First, it is real-time availability. Second, there are fewer conflict situations. The information provided by a CMR note in paper format is not always clear, the details are often unreadable, damage information is given separately and is incomplete. This often leads to disputes between sellers/buyers and transportation companies. An e-CMR note provides digital, clear information with GPS and date/time stamps; therefore, misunderstandings are less common. Third, there is less risk of VAT fraud. Not all CMR notes always “return”, and not all CMR notes provide clear evidence of the real transfer of an asset to another party at a particular time and place. An e-CMR note, in contrast, provides the GPS location, a date/time stamp and a clear identification of the business party to which the vehicle has been handed over. Some e-CMR software applications also provide additional checks during the transfer of the asset. Fourth, the advantage of e-CMR is lower costs. Documentation processing costs can be up to three to four times lower, as well as there is faster administration requiring reduced data entry. In addition, there is also more transparency providing data accuracy, transportation control and monitoring, real-time access to information and proof of receipt and delivery [6, 10]. It should also be emphasized that due to its digital nature, an e-CMR note could be easily integrated with other services used by transportation companies. By transiting to electronic format, the parties involved in each shipment operation will benefit from an increase in overall logistics efficiency, thereby leading to an increase in their economic competitiveness. This would also contribute to road safety, as an e-CMR note could be linked to the truck’s e-Call system, which automatically calls an emergency

service in the event of an accident. In addition, especially due the Covid-19 pandemic, e-CMR notes are a good solution for signing documents without physical contact [11]. It should also be emphasized that the e-CMR system enables transportation companies to manage their information and the logistics chain more efficiently, thereby raising the quality of data in the freight transportation process, reducing the risk of repeated errors, sharing their resources and integrating their operations into a single information system network.

Of course, there are also a number of challenges related to the introduction of electronic consignment notes: the cross-border acceptance of e-CMR consignment notes by the member states and their authorities (ratification of the Additional Protocol to the CMR Convention); a lack of generally applicable mandatory minimum rules for cross-border data on e-CMR consignment notes and the accompanying documents; difficulty in designing limited or country-specific models related to international standards for the cross-border introduction of e-CMR consignment notes, which results from the lack of a common approach to providing e-CMR consignment note services; a growing but still low amount of evidence on the acceptance of electronic transport documents in court and on the performance of transportation contracts concluded in electronic format; a lack of legal certainty concerning electronic format for external partners and actors, e.g. decisions by banks and insurance companies to accept electronic transportation documents; the reluctance or unwillingness of logistics chain actors to use e-CMR notes in providing transportation services.

However, given the advantages of the e-CMR system, the Ministry of Transport of Latvia has proposed the introduction of electronic contracts for the international carriage of goods by road, or e-CMR notes, indicating that transportation services represent one of the most important industries of the national economy, and in view of the large potential for the digitalization of logistics, especially in the field of road freight transportation, the introduction of electronic road transportation contracts (e-CMR consignment notes) is necessary [7].

Economic gains from introducing e-CMR. To estimate financial and time savings from the introduction of e-CMR notes, the research did a case study of an international manufacturing company producing corrugated board and sheets. The plant of the company is located in Latvia, and it supplies its goods to the neighbouring countries, currently using paper CMR notes. Every year the output of the company increases, as does the number of shipments as well as the number of CMR documents it deals with. On average, 35 trucks are loaded to export the goods to several cities in Lithuania and Estonia every day. The company ships both full truckload freight (the entire freight is delivered to a particular country – Lithuania or Estonia – to one customer) and groupage freight (transported to one country, yet there are several unloading points for delivery). Figure 1 shows the number of CMR notes issued in the last 5 years to ship freight to the neighbouring countries – Lithuania and Estonia.



Source: authors' construction based on company data, 2021

Fig. 1. **Breakdown of CMR consignment notes of the international manufacturing company (plant located in Latvia) by the neighbouring country in the period 2016-2020**

It could be concluded that the company's output and, consequently, number of CMR notes issued increased every year. In five years, the quantity of goods sold and shipped, which requires CMR notes to be issued, has increased by 41% to Lithuania and by 18% to Estonia, which could be explained by the growing demand for the company's products in the Baltic States.

To estimate the gains from introducing e-CMR, the calculations used information from the vrieurope.com website, which provides data on savings from replacing CMR with e-CMR in terms of time and money. The savings in time and money per CMR note copy are summarized in Table 1.

Table 1

CMR and e-CMR costs and time consumed per consignment note copy

Operation	Sub-operation	Duration, minutes		Cost, EUR	
		CMR	e-CMR	CMR	e-CMR
Issuing a consignment note	Printing	1	0	0.31	0
	Giving it to the carrier	3	0.5	0.93	0.15
Usage	Signing	5	5	1.54	1.54
	Correction (1%)	0.15	0	0.05	0
Filling in the note	Status restoration	3	0	0.93	0
	Archiving	3	0	0.93	0
	Sending (POD)	3	0	1.54	0
Total cost		**20.15**	**5.5**	**6.23**	**1.69**

Source: vrieurope.com

It could be concluded that it takes 20 minutes to issue a paper CMR note, and it costs EUR 6.23. In contrast, it takes 5.5 minutes to issue an e-CMR note, and the cost per copy is EUR 1.69. As shown in Table 1, the company's employee savings in terms of time are 14.65 minutes (i.e. on average 15 minutes) and in terms of money – EUR 4.54, which is 73% less compared with paper CMR notes. Besides, it is important that in case an external audit requires a scanned document or an original copy, the employee has to spend extra time in the archive searching for it.

In view of the fact that research studies on specific savings from replacing CMR with e-CMR are not available in Latvia, the TransFollow system of a Dutch company, which supplies a wide range of services regarding the introduction of e-CMR and cost savings for the companies introducing it, is given for comparison. Based on the data given in Figure 1, the research estimated potential savings for the company analysed in the last 5 years (Table 2 and Table 3).

Table 2

Comparison of CMR and e-CMR for the company analysed in terms of money in the period 2016-2020, EUR

Year	Estonia			Lithuania		
	CMR	e-CMR	Saving, EUR	CMR	e-CMR	Saving, EUR
2016	25 855	7014	18 841	40 059	10 867	29 192
2017	27 780	7536	20 244	42 738	11 593	31 144
2018	26 253	7122	19 132	51 067	13 853	37 214
2019	27 506	7461	20 044	50 046	13 576	36 470
2020	30 421	8252	22 169	56 600	15 354	41 246
Total	137 815	37 385	100 430	240 510	65 243	175 266

Source: authors' construction based on company data and calculations by vrioeurope.com, 2021

It could be concluded that with the introduction of e-CMR, the savings, based on the data for the last five years alone, from shipments to Estonia would amount to EUR 100 430 and to Lithuania – EUR 175 266. The time saved by issuing e-CMR notes to ship freight to Estonia would total 5401 h, which would be 675 working days or one full-time employee working for 2.7 years, and to Lithuania – 9426 h, which would be 1178 working days or one full-time employee working for 4.7 years.

Table 3

Comparison of CMR and e-CMR for the company analysed in terms of time in the period 2016-2020, h

Year	Estonia			Lithuania		
	Duration, h CMR	Duration, h e-CMR	Time saving, h	Duration, h CMR	Duration, h e-CMR	Time saving, h
2016	1394	380	1014	2159	589	1570
2017	1497	409	1088	2304	629	1675
2018	1415	386	1029	2753	751	2002
2019	1483	405	1078	2698	737	1961
2020	1640	448	1192	3051	833	2218
Total	7429	2028	5401	12965	3539	9426

Source: authors' construction based on company data and calculations by vrioeurope.com, 2021

The research found that over the last five years, the cost of processing CMR notes in terms of money has been EUR 378 thou. (Table 2) and in terms of time ~20 thou. hours (Table 3), which is 850 working days (3.4 years if assuming an average of 250 working days per year). If the e-CMR system had been introduced, it would have cost the company EUR 103 thou. and it would have taken 5567 hours or 232 working days (less than a year).

The calculation of the costs of and time spent on e-CMR notes for particular years revealed that in the last 5 years if the company had already introduced e-CMR, it would have been able to save EUR 276 thou., which would also be 15 thou. hours in terms of time (on average 618 working days). During the five-year period, the time savings would be approximately 2.5 years (if the average number of working days per year is 250), which is almost 50% of the period analysed. Therefore, it could be concluded that the use of CMR is a very time-consuming process; as a result, the company still has to take into account the cost of archiving.

E-CMR introduction costs. Since no calculations of the introduction of e-CMR have been performed in Latvia, and the Latvian Information Communication and Technology Association works on a pilot project to introduce it, the research uses data from the Dutch company TransFollow to estimate the costs of intruducing such a system.

1. The company's IP system connection to the TransFollow system – ~ EUR 15 thou.;
2. The creation of a user account and the configuration of settings – ~ 450 EUR per user, which totals EUR 3600;
3. The total annual fee for users, provided that there are 8 users – EUR 3600;
4. Employee training (8 users), the duration of training time for all is 8h, an hourly training cost is EUR 100. The training would be held online, and an average of 2 hours would be devoted to it every day. The cost totals EUR 800.
5. Unexpected expenses – 20%, totalling EUR 4600.

It could be concluded that in order to introduce this system, the company needs a total of approximately EUR 27 600, which would make up 0.5% of the company's total annual profit. The main benefits for the company from introducing the e-CMR system will be the traceability of the product throughout the logistics chain, and there will no longer be any questions concerning whether the carrier has already reached the customer or not. An e-CMR note enters the system immediately after it has been signed, and everything is visible; besides, warehouse personnel should spend less time printing, signing, stamping documentation, which takes a lot of time. There would also be no cases where a CMR note is lost and a new one must be printed, stamped and sent to the customer and also to the carrier in order to receive a delivery signature from the customer. If the system is introduced in Latvia, it could be also established in Lithuania and Estonia based on the same pattern. Besides, it is possible to correct potential errors faster without waiting for the original document to reach the company at the beginning of next month when the invoice and the original CMR note is sent by post. In addition, there will be more space in the archives and there will be no need to outsource services and pay for the paperwork done.

Of course, there are also some risks of introducing and using e-CMR. Major transportation companies introduce new corporate transportation management and data exchange systems, which can

also provide cross-border services. However, in very rare cases they could be considered to be e-CMR note services. Such databases and data exchange mechanisms are also not recognized by public authorities as a reliable source of data on CMR notes, and one of the barriers is that in most cases the information provided is incompatible with public data systems or does not meet the information requirements that would allow access to, for example, traffic police or customs officers. The non-acceptance by other national authorities is a barrier to the use of electronic documents, and there is a certain lack of understanding of the kind of data to be added to the CMR system.

Conclusions

1. Transportation services are one of the key components of international and domestic trade that aim to provide a continuous flow of goods and satisfy the needs. In view of progress in information technology, it is important to introduce electronic documents that partially or completely replace paper documents, as this saves time, financial and human resources and ensures traceability throughout the logistics chain. Also, it increases the security of transport documents and prevents the neutralization of transport documents.
2. A CMR document – a contract certifying the transfer of obligations from the consignor to the carrier or from the carrier to the consignee – is currently used for the carriage of goods in the EU. However, since 2017 it has been possible to use electronic CMR notes, which is not used in Latvia yet.
3. The number of freight shipments for the international manufacturing company analysed has increased by 50% between 2016 and 2020; as a result, the number of CMR notes increased as well. Given that the duration of processing a paper CMR consignment note was 20 minutes, which was EUR 6.23 in monetary terms (while the duration of processing of an e-CMR note was 5.5 minutes, which was EUR 1.69 per copy), it would be cost-effective for a company to introduce an e-CMR system.
4. To introduce an e-CMR solution, it is necessary to invest approximately EUR 27 600, which pays off in a couple of years at a sufficient number of shipments.

Author contributions:

Conceptualization, L.L.-K.; methodology, L.L.-K. and Z.O.; validation, L.L.-K. and Z.O.; formal analysis, L.L.-K. and Z.O.; investigation, Z.O.; data curation, Z.O.; writing—original draft preparation, L.L.-K.; writing—review and editing, L.L.-K.; visualization, L.L.-K.; All authors have read and agreed to the published version of the manuscript.

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