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Road Transport Safety in Northern Norway: How Buyers of Road Transport Services Can Contribute to a Road Transport with fewer Accidents and Near-misses*

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Abstract. This paper contributes to filling a knowledge gap by presenting new research within the practical field of road transport. It takes the buyers of road transport services as its point of entry and seeks to answer the follow question: How can buyers of road transport services contribute to safe road transport in northern Norway? A qualitative approach was selected for this study, and semi-structured interviews were conducted with six different buyers of road transport services. By using a modified version of The Pentagon Model, different aspects were analyzed in order to identify organizational characteristics and qualities that will improve the possibility for buyers of road transport to contribute to a safer road transport in Northern Norway and thereby contribute to fewer accidents and near-misses. The following characteristics and qualities were identified: 1) the importance of developing a detailed formal contract with the provider of road transport; 2) being aware of the possibilities with new technologies; 3) understanding that the decision criteria for ordering transport can influence road transport safety; 4) seeing the importance of good communication with both the transport organization and the authorities; 5) recognizing that knowledge of and trust in a transport organization is important but could also affect judgement regarding revisions and controls. This study suggests that buyers of road transport services can contribute to a safer road transport in northern Norway by emphasizing these five characteristics and qualities.
Keywords: *heavy goods vehicles, road transport safety, buyers of road transport services.*

Introduction

In January 2019, in the northern part of Norway, a young man died in a traffic accident involving an HGV (Heavy goods vehicle). The weather conditions were variable, with wind and precipitation in the form of snow. The young man was on his way back to school in a passenger car after celebrating Christmas with his family. Driving in the opposite direction was a Lithuanian HGV. The HGV was travelling at a speed of 88 km/h at the time of impact. The tires on the trailer were considered unsuitable for driving on snow and ice-covered roads, and the driver had not fitted the tires with snow chains at the time of the accident. The driver lost control of his trailer, which strayed into oncoming traffic. Approximately two and a half months after the accident, the young man died as a result of the injuries he sustained in the collision [1].

This chronicle is one of several severe accidents that occur between foreign HGVs and passenger cars in the northern part of Norway. The above-mentioned accident has, however, been of considerable importance in drawing attention to this predicament.

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[1] Accident Investigation Board Norway.Thematic report on serious accidents involving heavy goods vehicles: Framework conditions for ordering goods transport by road. AIBN report 2020/02. URL: https://havarikommisjonen.no/Vei/Avgitte-rapporter/2020-02-eng (accessed 25 August 2020).

Research shows that foreign drivers only account for 6 % of the average domestic transport in Norway, but they account for 11% of the HGVs involved in personal injury accidents. Furthermore, foreign HGVs are three times more likely to cause single vehicle accidents and twice as likely to be involved in head-on collisions. In addition, they seem to be more likely to trigger fatal accidents [1, Nævestad T.-O., Phillips R.O. et al. pp. 16–19]. In the years 2014-2018, HGVs were involved in 140 accidents with causalities in Norway. 34 (24%) of the accidents involved foreign HGV drivers, and these drivers were the triggering party in 10 (7%) of the accidents. Moreover, in 2010-2013, foreign HGV drivers were the triggering part in 58% of the accidents with causalities [2]. These numbers indicate that there has been a decrease in accidents where foreign drivers have been the triggering part; however, to achieve further decline, new interventions and measures must be put into place.

For new interventions and measures to apply foreign road transport organizations and drivers, it must be possible for Norwegian authorities to control and monitor them. This in order to ensure that foreign road transport organizations and their drivers meet Norwegian demands and standards for road transport with HGVs. Relatively new research in this field shows that: 1) management's commitment to safety is of importance regarding the organization's accidents rate [2, Mooren L., Grzebieta R. et al., pp. 86–88, 3, Newnam S., Warmerdam A. et al.]; 2) safety/driver training is associated with a reduced crash and accident risk [2, Mooren et. al.]; and 3) pay systems may negatively influence safety outcomes [3, Newnam et. al.; 1, Nævestad et.al., pp. 16–19]. These findings are important to address with interventions and measures, but regarding foreign drivers and organizations, it is unlikely that the Norwegian authorities can regularly control and monitor such factors, in particular, that concerning safety and driver training.

It is difficult to predict the future, but the amount of domestic and foreign road transport is unlikely to decrease in the years to come. It is therefore essential to put new interventions and measures into place. Forecasts for the years 2015–2030 indicate a 25% growth in traffic along Norwegian roads. Moreover, it is expected that the growth of HGVs will be significantly higher than for passenger cars. If new interventions are not implemented, there could be an increase of 175 people involved in deaths and severe injuries in 2030 compared to 2015 [3] To counteract this presumed development, The Ministry of Transport and Communications has highlighted concrete measures directed towards HGVs and their organizations. Research supports that new measures should be directed towards the HGV industry and emphasizes that there is a need to look deeper into the underlying causes of accidents involving HGVs [4, Newnam S. and Goode N., 5, Njå O. and

[2] Ministry of Transport and Communications. Veitrafikkulykker med tunge kjøretøy involvert [Roadtraffic Accidents involving Heavy Vehicles]. Report 2019. URL: https://www.regjeringen.no/contentassets/ec3cbab7ecef413bbe00888f3ba8f8cf/veitrafikkulykker-med-tunge-kjoretoy-involvert.pdf (accessed 27 August 2020).

[3] Meld. St. 33 (2016-2017) (2017). National Transport Plan 2018–2029. Oslo: Ministry of Transport and Communications. URL: https://www.regjeringen.no/en/dokumenter/meld.-st.-33-20162017/id2546287/ (accessed 27 August 2020).

Fjelltun S.H., 6, Nævestad T.-O., Phillips R.O. et al., 7, Grytnes R., Shibuya H. et al., 8, Nævestad T.-O., Elvebakk B. et al., 9, Nævestad T.-O., Hesjevoll I.S. et al.]. Traditionally, interventions intended to decrease accidents involving HGVs have often been directed at the individual level (driver-level). However, newer research emphasizes the importance of taking a more holistic and systematic approach to this matter [4, Newnam S. and Goode N., 10, Larsson P., Dekker S.W.A. et al.].

Therefore, in order to contribute to the research field of transportation safety, this study expands the view of possible actors that could affect safe road transport and through this takes a more holistic view of road transport safety. This study will accordingly take the perspective of those actors that purchase road transport assignments — that is, the buyers of road transport services. This study will explore how buyers of road transport services can contribute to safe road transport of goods in northern Norway and through this become important actors in reducing fatal traffic accidents. More specifically, knowing that foreign drivers might lack experience driving in severe weather conditions, which often appear in northern Norway, and drive vehicles not suited for that environment [1, Nævestad T.-O., Phillips R.O., 11, Langeland P.A. and Phillips R.O.], this study focuses on those who hire foreign road transport organizations to transport their goods to/from northern Norway. There has so far been little research that takes this approach, thus this study aims to contribute by filling this knowledge gap.

Road transport in Northern Norway

In the Northern part of Norway, there is, amongst others, two challenges that could especially affect the safety of road transportation: the scattered locations of businesses and the road environment [11, Langeland P.A. and Phillips R.O.]. The road environment consists of conditions such as challenging topography, vast mountain areas, deep fjords and adverse climatic conditions [12, Bardal K.G., p. 49]. In the years 2015–2019, 28 individuals were killed and 213 were injured in accidents involving HGVs in the northern part of Norway [4].

There are many businesses in need of road transport in northern Norway. As an example, salmon farming is one of the largest industries in this region, and it has considerable road transport needs. One of this study`s interviewees, who represents a large salmon farm, stated that their need for transport was approximately 6000 HGVs each year. The amount of salmon slaughtered in 2018 illustrates this need for road transport. In 2018, 551,000 tons of salmon were slaughtered. This accounts for 43 percent of the Norwegian volume of salmon and approximately 20 percent of total world production [5]. The road transport of salmon is mainly and mostly carried out by foreign road transport organizations and their drivers, according to this study`s interviewees. Research indicates that there is a specific challenge associated with foreign road users who

[4] Statistics Norway. Trafikkulykker med personskade [Traffic Accidents with human injuries]. (2020). URL: https://www.ssb.no/transport-og-reiseliv/statistikker/vtu (accessed 28 August 2020).

[5] Nordland Research Institute. Nord-Norge er en "supermakt" for oppdrett av laks [Northern Norway is a "Superpower" for Salmon Farming]. (2019). URL: https://www.kbnn.no/artikkel/nord-norge-er-en-supermakt-for-oppdrett-av-laks (accessed 28 September 2020).

lack experience in navigating narrow roads with high gradients/many curves and winter driving conditions [1, Nævestad et al., p. 4] yet it is just these circumstances that characterize the road environment in northern Norway in general, and even more specifically the road environment surrounding Salmon farms as they are mostly scattered across rural areas.

This notwithstanding, instead of exploring interventions and measures directed towards these foreign road transport organizations and their drivers, this study focuses on the buyers of road transport services in Norway. By setting demands on the foreign road transport organizations and their drivers, it is assumed that the buyers of road transport services in northern Norway could play an important role in positively affecting safe road transport [1, Nævestad T.-O., Phillips R.O., 13, Grinerud K., Sætren G.B. et al.]. Norwegian laws and regulations do, to some extent, impose responsibility on buyers of road transport services in this matter.

Regulations directed towards buyers of road transport services

There are currently some regulations that are directed towards buyers of road transport services and their responsibility when placing an order. These regulations are at best unclear and difficult to determine, especially for new actors in the industry. They are not to be found in paragraphs that are typically directed towards road transport. Rather, they are to be found in more general laws and regulations. This means that, in order to become familiar with these provisions, you must learn through experience.

The first regulation that is of interest here is stated in the Norwegian Penal Code. This is the law that regulates all criminal actions in Norway, and one paragraph has a provision about general complicit responsibility. It is stated that a penal provision also applies to any person who contributes to the violation, unless otherwise provided [6]. The interpretation of this provision is that it will come into force for buyers of road transport services if the transport organization they have hired violates current laws and regulations. Examples of this include overloading their vehicles, not obeying regulated driving hours or not paying their drivers the minimum regulated salary. It is the Norwegian Public Road Administration and the Norwegian Labor Inspection Authority that follow up on such cases, but a challenge is proving that the buyer of road transport services has not done their utmost to prevent the situation.

In addition to the provision about general complicit responsibility, there are provisions about information and duty of control. These provisions are provided for in regulations on information, duty of control and right of access [7], which regulate the responsibility of the transport organizations to inform buyers of road transport services about the salary and working conditions of their drivers. This is information that the buyers of road transport services must have before they decide to enter a collaboration with the transport organization.

[6] Penal Code (2005) The Norwegian Penal Code. URL: https://lovdata.no/NLE/lov/2005-05-20-28 (accessed 30 June 2020).

[7] Regulations on Generalizations (2008) Information-, duty of care and right of access code. URL: https://lovdata.no/LTI/forskrift/2008-02-22-166 (accessed 30 July 2020).

Further, there is also a provision about duty of control. The buyers of road transport services must ensure that the information they receive from the transport organization about their drivers' salary and working conditions is accurate. Moreover, they have the right to demand documents, etc., that confirm the information they received [1, Accident Investigation Board Norway]. These provisions are made to ensure that the drivers are working under good conditions.

This paper outlines important aspects that buyers of road transport services in Northern Norway should take into consideration when ordering road transport from foreign road transport organizations. It takes the buyers of road transport services as its point of entry and seeks to answer the follow question: *How can buyers of road transport services contribute to safe road transport in northern Norway?* In addition, the paper outlines some practical implications for buyers of road transport services and Norwegian authorities.

Further, a presentation of the theoretical framework will be given before the method and results are presented. This will be followed by a discussion linking the findings and related theoretical framework, and lastly, a conclusion.

Theoretical framework

In this study, a modified version of the Pentagon Model, originally developed by Schiefloe [14, Rolstadås A., Tommelein I. et al.] is used as an assessment tool to analyze five different features of six different buyers of road transport services.

In this section, a detailed explanation of the Pentagon Model [14, Rolstadås A., Tommelein I. et al., 15, Kongsvik T., Albrechtesen E. et al., pp. 68–72], and our modified version, will be given to explain its use in the analysis.

Pentagon Model

When an unwanted incident occurs, it is of vital importance its cause be found to prevent it from happening again. It is possible to investigate an incident on an individual or system level. Traditionally, traffic accidents have been investigated on an individual level, holding the driver responsible [4, Newnam S. and Goode N., pp. 141–142, 10, Larsson P., Dekker S.W.A. et al.]. When investigating on an individual level, the aim is to understand why humans act like they do. When investigating on a system level, the aim is to investigate the whole organization in order to identify its ability to avoid unwanted incidents [15, Kongsvik T., Albrechtesen E. et al.].

The Pentagon Model is an assessment tool that can analyze why unwanted incidents occur from a systems level perspective and can also be used to prevent them. Moreover, a Pentagon Model analysis can be used for planning and organizational development, for example by determining what kind of organizational characteristics must be in place in order to achieve certain qualities [15, Kongsvik T., Albrechtesen E. et al., pp. 68–72].

A Pentagon Model analysis combines a system-oriented approach and social constructivist theoretical approach to understand the working situation for the different actors involved. The

model places special emphasis on keywords like interpretation, sense-making, and interests and takes both formal and informal aspects into account [14, Rolstadås A., Tommelein I. et al.]. The model analyzes five different aspects: structure, technologies, culture, interaction and social relations and network. These are the most important variables that characterize an organization [15, Kongsvik T., Albrechtesen E. et al.]. *Structure* covers how the organization has defined roles, responsibility and authority. *Technologies* refers to tools, equipment, IT-systems and infrastructure that are essential to the activities of the organization. *Culture* consists of attitudes, values, norms and knowledge and establishes expectations for how "work is done here". *Interaction* involves communication and cooperation, while *Social relations and network* refers to important factors in all kinds of work, such as trust, friendship and access to knowledge [14, Rolstadås A., Tommelein I. et al., 15, Kongsvik T., Albrechtesen E. et al.].

In this paper, the Pentagon model has been modified to fit this research project. The model is adjusted so it can be used to determine the important aspects that buyers of road transport services should take into consideration before deciding which road transport organization should transport their goods. From the original aspect, *structure,* we have constructed the factor *formal contracts.* This concerns how the buyers of road transport services formalize their business relationship with the transport organization. *Technologies* is also included in the modified version. This factor covers whether there are formal criteria for the vehicle and equipment the transport organization must provide in order to acquire transport contracts with the buyers. The third aspect, *culture,* has been modified into *decision criteria*. Underlying this factor is what criteria are of greatest importance for the buyers of road transport services when deciding on which transport organization they want to hire. *Interaction* has been modified to *communication*, a factor that involves how the buyers of the road transport services perceive the importance of communication with the road transport organizations and governmental institutions. The last original aspect is *social relations and network* and from this the factor of *knowledge/trust* has been developed. It investigates whether knowledge and trust are important attributes when deciding on which road transport organization they want to contract with.

This modified version of the Pentagon Model analysis has been used to determine what kind of organizational characteristics must be in place in order to achieve certain qualities, qualities that are essential for buyers of road transport services who wish to contribute to safer road transport in Northern Norway.

Method

In the following section, a description of the research design, research participants, data collection and analysis method used in this paper will be provided. A qualitative approach was selected for this study, which seeks to gain in-depth knowledge about how buyers of road transport services can contribute to safe road transport in Northern Norway. To achieve such knowledge, it is essential to acquire the participants' experience and opinions about the topic [16, Langdridge D.

and Hagger-Johnson G.]. Data collection was therefore conducted through semi-structured interviews.

Research Participants and recruitment

Six interviews were conducted with six different buyers of road transport services. The interviewees were recruited due to their relevance in the road transport sector [17, Kvale S.]. All were employed in positions of responsibility for ordering road transport for their products. Participation was voluntary, and all the interviewees agreed to participate after being informed about the project and that they were able to withdraw at any time. The study was approved by the Norwegian Centre for Research Data (NSD).

The interviews were mainly carried out by two or three researchers in a face-to-face setting. The interviews were not recorded, but validity was ensured by sending all interview transcripts back to the informants for feedback. Each interview lasted approximately 45 minutes.

Data Collection and Analysis

A semi-structured interview guide [17, Kvale] was used to ensure the researchers were able to cover similar themes across the interviewees. The semi-structured interview guide included different topics.

First, the interviewees were asked to talk about their organization's formal structure.

Second, they were asked to discuss the criteria they use to determine from whom they order transport. Third, they were asked how they made sure the transport they ordered was safe and carried out according to laws and regulations. Finally, they were asked to add any additional information relevant for the study. During the entire interview, the researchers concentrated on allowing the interviewees talk and only interrupted if there were follow-up questions.

As an analysis tool, the Pentagon Model [14, Rolstadås A., Tommelein I. et al., 15, Kongsvik T., Albrechtesen E. et al., pp. 68–72] has been modified and applied to determine what kind of organizational characteristics must be in place in order to achieve certain qualities, qualities that are important for buyers of road transport services to have in order to contribute to safer road transport. The results are presented in the next section.

Results

By using the modified Pentagon Model, the following aspects have been analyzed for six different buyers of road transport services in order to identify the organizational characteristics and qualities that will improve their ability to contribute to a safer road transport with fewer accidents and near-misses: *formal contracts, technologies, decision criteria, communication and knowledge/trust.* First, an overall summary of the results will be presented for each aspect. Second, an overview of the results for each organization will be outlined (Table 1).

Formal contracts: All the interviewees stated that formal contracts were signed with the road transport organizations that transported their goods. Any demands directed towards the transport organization were detailed in the contracts, such as insisting that it must follow laws and regulations and use appropriate equipment and vehicles. However, in busy times, transport assignments were also carried out by transport organizations with whom they did not have a formal contract. Several interviewees stated that: *We create formal contracts with our main providers of transport, but we also use transport organizations ad-hoc in busy times* (Interviewee A, B, F). As maintaining a driver's license and CPC (Driver Certificate of Professional Competence) was an obvious requirement, only one interviewee stated that extra driver competence, education and courses were imposed. *The driver must participate in a course on customer service and optimal driving in order to be able to transport our goods* (Interviewee F). One of the interviewees also set demands in their contracts regarding the use of a driver computer, driver behavior, monitoring, etc.

Technologies: Five out of six interviewees stated that only new and modern vehicles could be used when transporting their goods. *The vehicle must be suited for Norwegian conditions, meet environmental demands, have at least a Euro 6 engine* (Interviewee A, B, D, F). One interviewee stated that in addition to this, the vehicles must also be fitted with alco measure (making the vehicle impossible to start if the driver has been drinking alcohol). One of the interviewees also demanded the use of driver behavior monitoring.

Decision criteria: All of the interviewees stated that the cost of the transport was of considerable importance when deciding with whom they should sign a transport contract. *We are concerned with cheap transport and use only foreign transport organizations when exporting our goods out of Norway* (Interviewee C). Another stated that *our biggest clients are in low-cost chains, so big volume is of great importance for us to be profitable. Therefore, transport prices are important when we make our decision to order transport (Interviewee A).* Some of the interviewees also stated that quality and flexibility in transport assignments were of importance, but in the end it all came down to the price.

Communication: Five out of six interviewees highlighted good informal communication with the road transport organization as very important. *We discuss delivery times, etc., openly and come to an agreement if there are any challenges* (Interviewee A). A day-to-day communication to clarify deviations in delivery or loading/unloading times was highly appreciated. Formal revisions of contracts and follow-up on the transport organization's compliance with laws and regulations were mostly absent. *We see it as other authorities' responsibility to control and follow up road transport organizations regarding laws and regulations* (Interviewee D). Most of the interviewees pointed out that communication with authorities about their responsibility when ordering road transport services is lacking. *How can we do things right when no one provides us with this important information?* (Interviewee E). More information about this matter is thus required.

Knowledge/trust: Five out of six interviewees chose a transport organization based on former knowledge of the organization, and the relationship is often based on trust. Because of their knowledge of and trust in their transport organization, follow-up concerning demands in contracts, etc., are often absent. *We trust our main contractors to carry out their job in line with the written contract, therefore we don't do follow-ups* (Interviewee D).

Table 1

Overview of the results — Buyers of road transport services

	Formal / informal contracts	Technologies	decision criteria	communication	knowledge/trust
Organization A	Large organization that orders approximately 500 road transport assignments each day. Creates formal contracts with their main providers of transport, but they also use transport organizations ad-hoc in busy times. The contracts set demands that the transport organization must follow laws and regulations, use appropriate equipment and vehicles, etc. However, the contracts do not set demands directed towards the competence of the driver except that the driver has a driving license and CPC (Driver Certificate of Professional Competence).	Set demands for their transport organizations that they must use appropriate vehicles and equipment. The vehicle must be suited for Norwegian conditions, meet environmental demands (at least Euro 6 engine). However, they do not set any demands regarding a driver computer, driver behavior monitoring, etc.	Concerned with environmental concerns. Transport organizations that transport their goods must use HVO fuel during the summertime and seek the possibility of using electric vehicles. Further, they only allow transport organizations that are considered "serious" and "lawfully" to carry their goods.	Close interaction with their transport organizations. They follow up with revisions each year where they control that the laws and regulations are followed. On a day-to-day basis they can discuss delivery times, etc., openly and come to an agreement if there are any challenges. Good communication is highlighted.	Highlighting the importance of using transport organizations they are familiar with. The relationship is based on trust.
Organization B	Large organization that orders approximately 6000 road transport assignments each year. Significant export need. Uses mostly foreign road transport organizations for this purpose. Creates formal con-	Set demands for their transport organizations insisting they must use appropriate vehicles and equipment. The vehicle must be suited for Norwegian condi-	Concerned with fast, cheap and punctual transport. They perceive the transport of their goods as a part of their value chain and only allow transport organizations that are consider "seri-	Follow up their transport organizations with ad-hoc controls of tires and chains during the wintertime. However, a lack of communication between those who order the transport and the management is mentioned	Strives to have a close interaction with their transport organizations, but numerous transport assignments in the ad-hoc market are compromising this.

	tracts with their main providers of transport, but also use transport organizations ad-hoc in busy times. The contracts set demands e.g. the transport organization must follow laws and regulations, use appropriate equipment and vehicles, etc. However, the contracts do not set demands directed towards the competence of the driver except that the driver has driving license and CPC (Driver Certificate of Professional Competence).	tions, meet environmental demands (at least Euro 6 engine). However, they do not set demands regarding a driver computer, driver behavior monitoring, etc.	ous" and that"lawfully" to carry their goods.	as a challenge.	
Organization C	Mid-size organization that orders approximately 140-240 road transport assignments each day. They create formal contracts with their main providers of transport. The contracts set demands e.g. that the transport organization must follow laws and regulations, use appropriate equipment and vehicles, etc. However, the contracts do not set demands directed towards the competence of the driver except that the driver has driving license and CPC (Driver Certificate of Professional Competence).	Set demands for their transport organizations by insisting that they must use appropriate vehicles and equipment. The vehicle must be suited for Norwegian conditions. However, they do not set any demands regarding a driver computer, driver behavior monitoring, etc.	Concerned with cheap transport and use only foreign transport organizations when exporting their goods out of Norway. They acknowledge that transport is a part of their value chain but do not execute revisions or controls when their main contractors use subcontractors.	Emphasizes good communication with their main contractors regarding deviations. For example, regarding loading/unloading times, delivery times, etc. They do not follow up with regular revisions in order to make sure laws and regulations are being followed	Considers the relationship with governmental institutions of great importance. They find laws and regulations regarding their transport buyer responsibility as unclear. They request more information and better cooperation between the government, road transport organizations and buyers of road transport services
Organization	Concerns a munic-	Set demands	Concerned with	They see it as other	Trust their main

D	ipality. They order transport like snow plowing and asphalt paving. They have formal contracts with their main providers of transport. The contracts set demands e.g. that the transport organization must follow laws and regulations, use appropriate equipment and vehicles, etc. However, the contracts do not set demands directed towards the competence of the driver except that the driver has driving license and CPC (Driver Certificate of Professional Competence).	for their transport organizations e.g. that they must use appropriate vehicles and equipment. The vehicle must be suited for Norwegian conditions, meet environmental demands (at least Euro 6 engine). However, they do not set any demands regarding a driver computer, driver behavior monitoring, etc.	cheap transport. They do not demand extra education of the driver, as long as the formal licenses are obtained. They have the possibility to set more demands in their contracts but have chosen not to do this.	authorities' responsibility to control and follow up on road transport organizations regarding laws and regulations. Day-to-day communication with main contractors are absent. There are meetings regularly.	contractors to carry out their job in line with the written contract. Do not follow-ups.
Organization E	Small start-up business with a limited road transport buyer need. It is expected that the need for transport will increase in the years to come. They have a contract with one large road transport organization. They have not set any demands in this contract. Instead, it is the transport organization that has designed the contract.	Has not set any demands regarding the vehicles and equipment the road transport organization uses when transporting their goods.	States that price is the most important factor when they order transport. Second in importance is flexibility.	Has little to no communication with the road transport organization and governmental institutions. They were not aware of their responsibility as a buyer of road transport services and call for more information in this matter.	Did not have any relation to the road transport organization before they hired them to transport their goods.
Organization F	Large organization that has contracts with 15 main contractors. They have formal contracts with their main providers of transport, but	Set demands for their transport organizations e.g. that they must use appropriate vehicles and equipment. The	Concerned with quality in road transport. The transport must be safe. Further, they have environmental concerns and aim to	Value close interaction with their transport organizations. They follow up with revisions each year where they control that laws and regula-	Highlight the importance of using transport organizations they are familiar with. They tend to use small and middle-sized transport organi-

	they also use transport organizations ad-hoc in busy times. The contracts set demands e.g. that the transport organization must follow laws and regulations, use appropriate equipment and vehicles, etc. In addition, the contracts set demands directed towards the competence of the driver. Their drivers must participate in optimal driving course	vehicle must be suited for Norwegian conditions, meet environmental demands (at least Euro 6 engine). Also, they set demands regarding a driver computer, driver behavior monitoring, etc.	be a market leader in environmentally friendly transport. Finally, they are concerned with transport prices. They find it very important that all drivers have taken a course in optimal driving in order to decrease the number of accidents.	tions are followed. On a day-to-day basis they can discuss delivery times, etc., openly and come to an agreement if there are any challenges. Good communication is highlighted.	zations because trust and easy to access and communication is highly valued.

Discussion

Previous research shows that buyers of road transport services have the possibility to influence safe road transport by setting demands directed towards road transport organizations [1, Nævestad T.-O., Phillips R.O. et al., 13, Grinerud K., Sætren G.B. et al.]. However, to set such demands, the buyers must possess some organizational characteristics and qualities. By using the modified version of The Pentagon Model as an assessment tool, some of these characteristics and qualities have been identified:

- Understand that their decision criteria for order transport can influence road safety
- The importance of entering a formal contract with their provider of road transport
- Being aware of the possibilities and use of new technologies
- See the importance of good and even communication with both the transport organization and the authorities
- Recognize that knowledge and trust with the transport organization is important but could also affect judgement regarding revisions and control

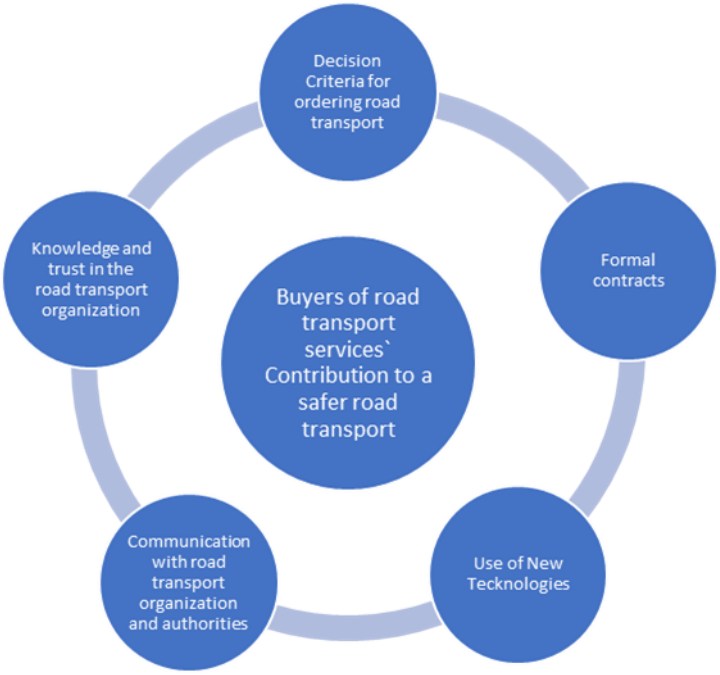

Fig. 1. Buyers of road transport services` contribution to a safer road transport

Decision criteria

The road transport industry is a low-earning industry, and the average financial result for a transport organization is between 2–5 % [13, Grinerud K., Sætren G.B. et al.]. This leads to a stringent prioritization of assets. By constantly pushing prices down, the buyers of road transport services influence the ability of the transport organizations to prioritize safety work, such as safety/driver training. In our interviews, most participants stated that they did not demand additional safety/driver training, and consequently, they were unwilling to pay extra to provide this. Some interviewees even said that additional safety/driver training was not taken into consideration at all when deciding on a transport assignment, this despite the fact that additional safety/driver training is associated with a reduced crash and accident risk [2, Mooren L., Grzebieta R. et al., p. 79].

Buyers of road transport services should be concerned with this fact, especially when ordering road transport to/from northern Norway from foreign road transport organizations during wintertime. It is stated that local knowledge about weather and driving conditions is of importance [12, Bardal K.G., p. 50] to ensure road transport is carried out in a safe manner. It is likely that foreign drivers who lack winter driving skills would improve their driving competence if those who purchase their services would demand additional knowledge and safety/driver training. This would in turn imply that road transport organizations must offer such training in order to gain transport assignments.

However, for the road transport organization to follow through with this, there must be assets available to fund such training. The responsibility for this matter should lie on both the road transport organization and the buyer of the road transport service. Consequently, the decision criteria applied by buyers of road transport services cannot be restricted to choosing the cheapest

provider. In this sense, the grounds on which the buyers of road transport services make their decision could influence how they contribute to safer road transport.

Formal contracts

Before transport organizations can carry out the transport, it is essential that a formal contract between the buyer and provider is established. In this study, all interviewees state that formal contracts are generally in place before the transport is carried out. However, these contracts seem to be concerned about topics such as following laws and regulations, using modern vehicles, the consequences if the transport is delayed, etc. There are seldom demands directed towards, specific driver competence, the use of management systems to monitor driving behavior and driving/resting times, etc.

To increase road safety, buyers of road transport services could consider crafting more detailed contracts with their transport organizations. Contracts that state that the transport organization shall follow laws and regulations seem to wage in this context. Instead, the buyers of road transport services should set demands that are clear and concise, e.g. demand that the road transport organization have a safety management system like ISO 39001 or similar [8, Nævestad T.-O., Elvebakk B. et al., p. 387].

However, it is not enough to simply set detailed demands into a contract. The contract needs to be followed up with revisions and control on a regulatory basis. Several of the interviewees in this study stated that they do not follow up on the demands in the contracts, trusting instead the transport organization to carry out the transport in line with the contract. It could be assumed that depending on such trust makes it difficult to discover any deviations from the terms of the contract, as there is a complete lack of regulatory revisions and controls. In comparison, following up formal detailed contracts with regulatory revisions and control could be a factor that increases road transport safety.

Use of new technologies

The use of new technologies is stated to be one of the most important factors for reducing casualties and injuries in traffic accidents [8]. A way to make the contracts more detailed would be to insist on the specific use of new technologies, especially the technologies that new vehicles is equipped with. By including such demands, it would be easier to track and monitor driver behavior, driving-resting time and loading-unloading time. Measures can thus be put in place to avoid certain situations and create safer transport routes.

The use of new technologies such as GPS and tracking systems would be of specific help in planning transport routes. For example, if a driver experiences some challenges on one route, a

[8] Meld. St. 33 (2016–2017) (2017). National Transport Plan 2018–2029. Oslo: Ministry of Transport and Communications. URL: https://www.regjeringen.no/en/dokumenter/meld.-st.-33-20162017/id2546287/ (accessed 27 August 2020).

message could go out to the rest of the drivers in his/her road transport organization to inform them of this issue. For foreign drivers, this would assist in choosing another route and acquiring important local knowledge about the area without being present. The consequence could be that the drivers receive better background information on which to base their decisions.

Demanding the use of new technologies in contracts would also encourage transport organizations to integrate this into their management system and use it more consciously. An on-board safety monitoring system is a good example of how new technologies can help identify risky driving behavior [18, Luke R. and Heyns G.J.].

Communication with road transport organizations and authorities

For buyers of road transport services, good communication with road transport organizations will likely contribute to road transport safety. The interviewees in this study highlight the importance of day-to-day communication with their transport providers. If any deviation in the transport route occurs, good communication and a strong relationship allow any misunderstandings to be resolved. For example, if a road transport organization knows it will be fined by their buyer if the transport is delayed, they are more likely to carry out the transport assignment in unsuitable weather conditions, which makes them more vulnerable to accidents. On the other hand, if a road transport organization can call the buyer, explain the situation and thereby avoid a penalty, then they are more likely to stop and wait for better weather conditions.

The value of good communication can also be extended to the relationship between the buyers of road transport services and the authorities. There are several laws and regulations directed towards buyers of road transport services [9, 10], but these are not easily discovered, especially by new organizations and start-ups. One of the interviewees (a start-up organization) stated that, even though they scheduled a meeting with the Norwegian labor inspection directly after opening their business, no information about their responsibilities were mentioned. Other interviewees stated that they knew about them, but only vaguely.

If new and small buyers of road transport services are to set the necessary demands for their transport organizations, information regarding this matter must be a priority. There is, however, currently a lack of both information and education directed towards buyers of road transport services regarding their responsibility for a safe road transport.

Knowledge and trust in the road transport organization

Most of the interviewees in this study emphasize the importance of choosing a road transport organization they are familiar with, and this business relationship is built on knowledge and trust. On the one hand, this reasoning can be important to safer road transport because it

[9] Penal Code (2005) The Norwegian Penal Code. URL: https://lovdata.no/NLE/lov/2005-05-20-28 (accessed 30 July 2020).

[10] Regulations on Generalizations (2008) Information-, duty of care and right of access code. URL: https://lovdata.no/LTI/forskrift/2008-02-22-166 (accessed 30 July 2020).

might facilitate communication and lead to a relationship where challenges and deviations can be quickly resolved. On the other hand, choosing transport organizations based on knowledge and trust could lead to a situation where contracts are not important and regular revisions and controls are absent. Consequently, this can affect the buyers' possibility to set demands on their transport organizations, thereby affecting the safety of the road transport.

Practical implications

This study has shown that there are some characteristics and qualities that buyers of road transport services should take into consideration to contribute to a safer road transport in Northern Norway, that is, a road transport with fewer accidents and near misses.

First, buyers of road transport services should be aware of how their decision criteria for ordering transport can influence road safety. If their decision is made solely with respect to price, it puts the transport organization in a position where they have few resources to spend on safety work. Second, a detailed formal contract with their transport providers is essential in the sense that demands can be made to increase road transport safety. Third, demanding the use of new technologies can make road transport more transparent and put necessary measures in place. Fourth, facilitating good communication with the transport organizations can help avoid misunderstandings regarding transport delays and other unforeseen challenges. Fifth, buyers should choose transport providers they are familiar with, but must be aware of the pitfalls if their relationship is based solely on knowledge and trust.

As for the Norwegian authorities, it is important to be aware of the lack of knowledge buyers of road transport services have regarding their responsibility for a safe road transport. More education and information must be given in this matter, and directed especially towards new organizations, start-ups and small business that order road transport.

Implications, Limitations and Further Research

This study is of value to buyers of road transport services, as it can increase their awareness of how they can contribute to a safer road transport. This is especially true for those buyers of road transport services located in and scattered across rural areas in northern Norway, as the driving conditions in these areas often demand very skilled drivers with good local knowledge about the area.

Further, this study can assist the Norwegian authorities by identifying the lack of knowledge buyers have about their responsibility for safe road transport. Recommendations include developing education and courses and directing relevant information towards the group in question.

The numbers of interviewees can be a limitation in this study. However, the researchers sampled interviewees with diversity, ranging from large organizations to new start-ups. All partici-

pants were experienced and knowledgeable, and substantially information was given to the researchers. Nonetheless, more research on the topic should be conducted.

There is little research on buyers of road transport services and their role in contributing to a safer road transport. Further research should focus on the aspects mentioned above, especially with the aim of acquiring in-depth knowledge from buyers of transport services and decision makers in these organizations.

Conclusion

The research question for this study is as follows: *How can buyers of road transport services contribute to safe road transport in northern Norway?* By using a modified version of The Pentagon Model, different aspects were analyzed in order to identify organizational characteristics and qualities that will improve the possibility for buyers of road transport to contribute to a safer road transport in Northern Norway and thereby contribute to fewer accidents and near-misses.

There are two challenges in particular that affect the safety of road transportation in northern Norway: the scattered locations of businesses [11, Langeland P.A. and Phillips R.O.] and a road environment with challenging topography, vast mountain areas, deep fjords and adverse climatic conditions [1, Nævestad T.-O., Phillips R.O. et al., p. 4, Bardal K.G., p. 49]. These challenges demand that drivers have skills and knowledge about driving in such an environment with such conditions.

Consequently, buyers of road transport services need to be sure that the drivers they hire have these skills and knowledge. Therefore, buyers of road transport services should consider: 1) developing a detailed formal contract with the provider of road transport; 2) seizing the opportunities with new technologies; 3) whether their decision criteria for ordering transport could influence road transport safety; 4) the importance of good communication with both the transport organization and the authorities; 5) that knowledge of and trust in a transport organization is important but could also affect judgement regarding revisions and controls.

This study suggests that buyers of road transport services can contribute to a safer road transport in northern Norway by emphasizing these five characteristics and qualities. By doing so, it will be the buyers of road transport services that set the demands for the transport organizations as they will choose to hire only those that fulfill them. In this way, foreign, as well as domestic, road transport organizations will be forced to comply with these demands to acquire transport assignments.

Conflict of interest

The author declared no potential conflict of interests with respect to the research, authorship and/or publication of this article.

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