



Truck drivers prefer traditional mirrors over camera systems: A questionnaire study

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Introduction

Camera-based mirror systems (CBMS) offer potential advantages such as aerodynamic improvements and the reduction of blind spots. However, possible disadvantages of CBMS include the lack of redundancy in case of electronic failure and diminished depth perception (Moore et al., 2023). Mirrors also allow drivers to adjust their viewing angles by moving their head.

Previous surveys indicate that CBMS received mixed acceptance ratings from truck drivers, but these studies have the drawback of being conducted some years ago (Schmidt et al., 2016) or considering camera systems in general without specifically addressing CBMS (De Winter et al., 2024). A questionnaire study from Germany among 364 regular vehicle drivers (Bernhard & Hecht, 2022) found a positive attitude towards CBMS but a preference for normal mirrors combined with blind spot detection. However, in their study, only two respondents indicated having ever used such a system before.

Methods

Between 25 April and 30 May 2024, we conducted an online questionnaire among 768 predominantly professional drivers recruited via invitations disseminated through the website www.chauffeursnieuws.com and corresponding LinkedIn and Facebook pages. A concise 6-item questionnaire in Dutch was used to minimize completion time and thereby increase the number of respondents. The questionnaire addressed the replacement of conventional side mirrors with camera systems. Since central rear-view cameras on trucks have become standard and serve to extend the driver's view rather than replace mirrors, these systems were not considered. Also, this study does not address blind spot information systems, which recently became mandatory on all trucks registered in the European Union (European Parliament and Council, 2019).

Results

The results of the questionnaire are shown in Table 1. Almost all respondents indicated they were professional drivers (Q1). They mainly drove a truck (Q2; 93%), and most had prior experience with CBMS (Q3; 73%). Furthermore, respondents predominantly preferred mirrors (78%) over a CBMS (18%) (Q5).

We calculated the Phi coefficient (ϕ), a measure of the strength of association between two binary variables. It is a specific case of the Pearson correlation coefficient, used when both



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variables are dichotomous. Neutral responses for Q4 and Q5 were omitted. The ϕ between Q3 and Q4 was -0.11 ($p = 0.006$) and the ϕ between Q3 and Q5 was -0.12 ($p < 0.001$). This indicates that drivers who had ever driven with cameras were more positive about cameras, although this association was weak. The ϕ between Q4 and Q5 was strong, at 0.87 ($p < 0.001$), which indicates that perceived safety and preference are strongly associated.

Table 1. Results of the questionnaire (total sample size: 768)

	No	Yes			
Q1. Are you a professional driver?	12	756			
	Truck	Passenger bus	Courier van	Car	Other
Q2. What do you drive?	713	25	1	9	20
	No	Yes			
Q3. Have you ever driven with cameras instead of mirrors?	210	558			
	Cameras	Neutral	Mirrors		
Q4. What do you find safer in traffic?	141	93	534		
Q5. Do you prefer mirrors or cameras?	138	29	601		

Finally, the responses to an open question, “Please explain your choice: Do you prefer mirrors or cameras?” (Q6), were analyzed with the ChatGPT API (model: gpt-4o-2024-05-13; date: 25 June 2024). The results of this analysis are shown in Table 2. Respondents favored cameras over mirrors for their improved visibility and reduced blind spots, ease of maintenance (e.g., keeping clean), and positive experiences after an initial adjustment period. Respondents who preferred mirrors cited reasons such as their reliability, better depth perception, and the possibility for reciprocal eye-contact, and better comfort.

Table 2. GPT-based summaries for the responses to the question “Please explain your choice: Do you prefer mirrors or cameras?” (Q6).

Respondents with a preference for cameras, based on Q5 (n = 138):
<p>Prompt: Summarize the respondents' statements below using a maximum of 6 concise bulleted highlights, focusing on why the respondents prefer cameras. Do not mention the respondent numbers.</p> <p>GPT-4o:</p> <ul style="list-style-type: none">- Enhanced Visibility: Many respondents highlighted that cameras provide a much better and wider view, reducing blind spots significantly.- Weather Resistance: Cameras remain clear and functional in adverse weather conditions, unlike mirrors which can get dirty or obstructed by rain.- Safety Improvements: The reduction or elimination of blind spots with cameras contributes to increased safety, especially in complex traffic situations like roundabouts.- Ease of Maintenance: Cameras are easier to keep clean and do not suffer from issues like water droplets or dirt accumulation that affect mirrors.- Technological Advantages: Features like automatic adjustment, clearer night vision, and the ability to see around corners or in tight spots make cameras more advantageous.- User Preference: Many users, after getting accustomed to cameras, prefer them over mirrors and do not wish to switch back due to the overall better experience.



Respondents with a preference for mirrors, based on Q5 (n = 601):

Prompt:

Summarize the respondents' statements below using a maximum of 6 concise bulleted highlights, focusing on why the respondents prefer mirrors. Do not mention the respondent numbers.

GPT-4o:

- **Reliability and Maintenance:** Mirrors are always functional and easier/cheaper to repair compared to cameras, which are prone to technical issues and expensive to fix.
- **Depth Perception:** Mirrors provide better depth perception, making it easier to judge distances, especially when maneuvering or driving in poor weather conditions.
- **Visibility in Adverse Conditions:** Mirrors offer clearer visibility in rain, snow, and low-light conditions, whereas cameras can become obscured by water droplets or glare.
- **Eye Contact and Communication:** Mirrors allow for eye contact with other road users, enhancing safety through mutual visibility ("see you, see me" principle).
- **User Comfort and Familiarity:** Many respondents are accustomed to mirrors and find them more comfortable and less straining on the eyes compared to camera screens.
- **Safety Concerns:** Mirrors are seen as safer because they do not rely on electronics that can fail, and they provide a more natural and direct view of the surroundings.

Discussion

In the truck industry, the replacement of traditional mirrors with camera-based mirror systems (CBMS) raises questions that are paralleled in many other sectors where technological innovations do not always equate to an improved user experience. This work provides recent insights into the acceptance of CBMS. A key result is that CBMS are not preferred by the majority of truck drivers. These findings raise questions about how and why this technology has been introduced. Improved fuel efficiency and reduced blind spots are important arguments for CBMS. However, the fact that professional drivers are generally not appreciative of the technology raises concerns about the discrepancy between engineering innovations and user reception. Truck drivers are also dissatisfied with other systems like lane departure warnings (De Winter et al., 2024).

Although the current study has a substantial sample size, there remains a possibility of bias. Specifically, it is possible that drivers who subscribed to *Chauffeursnieuws* and who responded to the questionnaire are not representative of all drivers in the Netherlands. A recommended method to investigate the robustness of the current results would be to ask the same questions at a truck parking area.

References

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