Institute of Transport Economics
Norwegian Centre for Transport Research

Summary

Talk about traffic safety

An investigation of chatbot technology as a communication tool

TØI Report 1751/2020
Author: Siri Hegna Berge
Oslo 2020 33 pages Norwegian language

New digital tools such as chatbots have the potential to increase the availability of research on traffic safety. A chatbot is software that uses speech and text to communicate through messaging services or a webpage. This report investigates the possibility of a chatbot conveying traffic safety. Data were collected using literature review and interviews. A useful chatbot needs to be conceptualized to reach a target audience with a need and interest to learn more about traffic safety. Development of a traffic safety chatbot must be publicly funded through a major collaboration and innovation project. One idea is to explore how we can use a dialogue-based user interface to influence traffic behaviour, and make the target group better equipped to handle traffic safety. Development and testing of a chatbot as a communication tool would be a part of the project's purpose of creating safer traffic for everyone.

Communication of research on traffic safety

There is an extensive body of research on traffic safety. However, the research is not always easily available to the public, and communicating knowledge from research institutions in ways that are clear and comprehensible can be challenging. With funding from the Norwegian Public Roads Administration and the Ministry of Transport, TØI has compiled the Handbook of Road Safety Measures, which is a collection of systematic knowledge on road safety measures. The handbook is a tool for reducing accidents and injuries in traffic. The handbook is not well known outside of the transport sector, and not everyone who could benefit from the knowledge it contains actively uses it. New digital tools have the potential to increase the availability of research on traffic safety.

Chatbots are software that communicate with the user through speech or text. As an innovative and interactive technology, they offer an alternative or supplement to traditional information services. As the information provided by the chatbot is controlled by the developers, chatbots can present trustworthy and high quality information. This is especially important given the amount of false and misleading information on the internet. A chatbot can help break down the barriers between the available information and the recipients, and simplify access to traffic safety research.

Objective and method

This report investigates the viability of a chatbot solution for communicating traffic safety knowledge to individuals, companies and organizations.

The study had an exploratory approach and aimed to answer the following questions:

- What is the potential of a chatbot for traffic safety?
- Who are the potential target groups of a chatbot that provides information on traffic safety?
- How can the Handbook of Road Safety Measures be used in combination with a chatbot?

To help answer these questions, data was collected through a literature review of previous research on chatbots in transport and as a communication tool. Interviews were also conducted, focusing on potential target groups and need for a chatbot conveying traffic safety. The interviews were semi-structured and the five subjects were representatives from companies and research institutions working on traffic safety; development of information systems and chatbots; and/or visualization and communication.

The methodical approach to the qualitative interview data was thematic analysis based on Braun and Clarke's (2006) six phases to organize qualitative data, and Ryan and Bernard's (2003) technique for identifying themes in data material.

Chatbot as a traffic safety communication tool

The literature review showed that chatbots, as dialog-based user interfaces between data and online services, can be effective and easy-to-use. Chatbots are claimed to be a social technology as they take on roles that previously belonged to humans. In a society with extensive amounts of information at hand, chatbots can contribute to more efficient information retrieval and work as supplement to more traditional information services.

Studies indicate that chatbots allow for verified and individually tailored communication that encourage user-provider interaction. However, chatbots need to adequately understand natural language to properly process requests. Responses deemed unsatisfactory can result in a bad user experience, and especially when used in customer service, the chatbot must redirect the user to a human agent in due time.

Studies on chatbots do not indicate that the use of chatbots result in higher learning outcomes than more traditional methods, but they can provide better learning outcomes over time. In order for a chatbot to function as an educational tool, it must be designed pedagogically not to distract the user from the subject. The chatbot must be able to write and read data from external databases and provide valuable responses to its users. Moreover, the chatbot should have an easy interface, and the use should be simple and convenient.

In the thematic analysis of the interview data, seven main themes and thematic subgroups were identified. Table S1 shows the themes and sub groups.

Table S1: The themes and sub groups.

Theme	Sub group
Functionality (5)	Efficiency (5), Guiding function (2), Communication (4), Utility value (5)
Knowledge transfer (5)	Learning styles (4), Functions and purposes (5), Visual design (4), Other ideas (3)
Ethical issues (4)	Dissemination (4), Regulation (2), Norwegian traffic safety abroad (2)
Development (5)	Planning (3), Goal setting (4), Design (5), Language (4), Maintenance (4), Financing (3), Target group (5)
The human aspect (5)	Automation (4), Personalized communication (4), Language (4)
Attitudes (5)	Use of chatbots (5), Chatbot as conveyer (4), Disadvantages of chatbots (4)
Handbook of Road Safety Measures (3)	Website content (2), System and structure (2), Opportunities (3)

Note. The number in the parenthesis refers to the amount of respondent that mentioned the theme or sub group during the interviews.

Taken together, the literature study and analysis of the interviews indicate three essential factors to consider when evaluating chatbot as a traffic safety communication tool:

1. Chatbots as communication tools
2. Development
3. Chatbot for the Handbook of Road Safety Measures

1. Chatbots as communication tools

The benefits of using a chatbot as a tool for communicating traffic safety knowledge, is that chatbots can communicate traffic safety in a new and simplified way. Chatbots can be implemented in popular platforms that are used on a daily basis, and can address the users directly. This allows for a more active communication of traffic safety research than previously.

Chatbot technology is widely used in smartphones, and this places greater demands on the information that is communicated. Content for smartphones must be refined, simplified and adapted to a dialogue format. The process of simplifying content, and in this case research, places a demand on the copywriters and for quality reassurance. Furthermore, it is not always possible to provide simple answers and sound advice on complex issues.

Presenting information in a dialogue format may be practical for some users. The advantage of simplified material is that it helps the user focus on the content. Many users prefer having small fragments of information presented rather than reading long texts.

Chatbot technology opens up new opportunities for gathering large amounts of user and usage data that can, for instance, be used to investigate needs of the population regarding traffic safety, and which topics they find most or least interesting. The data can be used for further development of the chatbot and for research purposes.

In the interviews, most of the informants thought that an English and updated translation of the Handbook of Road Safety Measures's website was a good idea. This, however, presents some challenges. For instance, communicating traffic safety knowledge to the countries that can benefit most can be an issue, as legislation in countries varies.

2. Development

When developing a chatbot for traffic safety, the project team must consider the design of the chatbot, especially with regard to the degree of freedom or flexibility of the user. A flexible, intention based chatbot you can ask anything, is more costly than a structured chatbot, in which the interactions are largely predetermined. There are also lower costs associated with development of a chatbot using a preexisting platform than developing a separate application.

Development of a traffic safety chatbot will most likely require public funding. One possibility is to embody the development into a larger project, funded by the Norwegian Research Council. For example, a chatbot could be a work package in a project on exploring how we can use dialogue based user interfaces to influence behaviour in traffic. The purpose of the project would then be to make a target group better equipped to handle traffic safety.

Regarding the target group of a chatbot that conveys traffic safety, there are several opportunities. Mainly private individuals, non-profit organizations, education of children and youth, as well as driver training. However, refining the concept to a target group with an interest in and a need for more knowledge about traffic safety is of the essence.

3. Chatbot for the Handbook of Road Safety Measures

Implementing a chatbot in the Handbook of Road Safety Measures' website can be problematic considering the professional users. Users such as employees from the Norwegian Public Roads Administration or the Norwegian Road Directorate, may be interested in information to make decisions about the design of infrastructure or traffic safety measure, and in these cases the information provided by a chatbot may not be comprehensive enough.

A chatbot on the handbook's website *can* be a useful supplement to the current search feature if there is adequate funding for development and maintenance.

In order for a chatbot on the Handbook of Road Safety Measures' website to become a reality, the website has to be technically upgraded. There is also a need for standardization of the terms used in the handbook. The most realistic opportunity for developing a chatbot for the Handbook of Road Safety Measures is through a major research project with support from the Norwegian Research Council. The scope of such a project could be to lay the foundation for sufficient structure and metadata in the website programming in order to present content across communication tools, such as websites, mobile devices, or a chatbot that can present visual elements and/or a chatbot with a speech function.

Conclusion

There is an extensive body of research and information available online, but finding the right information in an effective way is a challenge. A chatbot can help break down the barriers between available information and the recipients, and give easier access to traffic safety research.

It is important that a chatbot for traffic safety is perceived as user-friendly and that it has a concrete utility for the users. Especially when the chatbot conveys traffic safety knowledge, it is essential that users can trust that the information is verified and correct.

A chatbot as a communication tool on knowledge of traffic safety can be useful if the concept is conceptualized and pinpoint a target group with a need and interest in learning more about traffic safety. The most relevant user groups are people who prefer having information presented by others rather than finding the information themselves on a website.

When it comes to implementing a chatbot in the Handbook of Road Safety Measures, the current report concludes that no chatbot is better than a bad chatbot. Adequate funding is therefore important to cover both development and maintenance. The most realistic way to develop a chatbot in this context is through a larger collaboration and innovation project with funding from the Norwegian Research Council. The purpose of a traffic safety chatbot project could be investigating how dialog-based user interfaces affect traffic behaviour, and make the target group better equipped to handle traffic safety. As a part of the project, it will be necessary to identify user groups and needs, as well as assess the extent to which the content of the Handbook of Road Safety Measures can be used as a resource, and find ways to simplify complex research and knowledge into something concrete and easy to understand. Development and testing of a chatbot as a communication tool would be a part of the project's purpose of creating a safer traffic for everyone.