What will it cost to own & operate driverless trucks in the future?

Albin Engholm is a PhD student at ITRL with a background in sociotechnical systems engineering.

In this interview, Albin shares some of his thoughts on his (along with co-authors Anna Pernestål and Ida Kristoffersson of VTI) most recent publication:

"Cost Analysis of Driverless Truck Operations"

In order to make ITRL's research more accessible to both industry and the public, we asked a range of questions designed to give an overview of Albin's paper and inspire you to learn more.

What is the article about?

The article is about estimating how the cost for owning and operating trucks could change when trucks become driverless in the future. That is important for several reasons: first because it is important groundwork to do if you would like to understand how the transition towards driverless will go, because the potential economic benefits is one influential aspect for that. And also, if we would like to do further modeling and analysis of a transport system with driverless trucks then it is important to know the cost structure of this new technology compared to manually driven trucks, so that is the main entry point to this study.

What are the main results?

For an average truck ton kilometer, there will be substantial cost saving with driverless trucks. We have made calculations for three different scenarios: reflecting optimistic, intermediate and pessimistic assumptions on the cost benefits of driverless trucks in the literature. All scenarios are reflecting a future in which driverless trucks is a mature technology. Very roughly, in the most optimistic scenario, the cost savings may be up to 50%; in the intermediate 30-40%; and in the more pessimistic scenario, 15%.

So I think the results show that there is potential for significant cost savings, but a huge uncertainty about the exact extent of these savings. But in either case, even in the pessimistic scenario, it is substantial cost savings. Typically when you launch a new generation of conventional trucks with a new engine and improved performance, you might save a few percent on operating costs, but when going driverless, even with the pessimistic assumptions you would save at least 15%. And we take into account the total cost of ownership, so it is pretty significant cost savings.

What are the possible implications of the research?

There have been a lot of discussions already about how much cheaper driverless trucks could be to operate compared to human driven trucks. However, most of these estimates are from consultancy companies or truck manufacturers or other actors with commercial interests, and their calculations are not very transparent typically. I think an important implication could be that since we have a transparent way of presenting our calculations and the assumptions that we made, it can lead to a more informed discussion about why there are economic benefits and how this money is actually saved; from what mechanisms so to speak. Since driverless trucks are still not deployed on a large scale it is very uncertain to what extent the potential cost savings will be realized. Certainly, many of our assumptions will prove to be wrong, because they are limited to current knowledge, but at least it is a transparent calculation.

Interview with an ITRL Researcher

How would you say that the research could make a positive impact on society?

I hope that it leads to a more informed and more transparent discussion related to this technology, because there is a lot of buzz about it and there are very clear potential economic benefits. This comes with both good and bad things. There is clearly a market opportunity and there is a reason why there is a lot of capital invested in this area. Also, reduced transport costs is a direct societal benefit. But there are of course some potentially less positive effects. One thing is that the demand for freight transport might increase quite a lot because truk transport would become much cheaper. Being able to know and be informed about that is important in making a conscientious strategy for how this technology should be managed. From the public sector point of view, asking in what ways should we support it to make it have a positive impact and not to "steal jobs" and run a lot more truck kilometers, which has obvious challenges from a climate perspective if not managed properly.

What should industry be paying attention to in regards to the article?

Good question. This depends on how we think of industry and how we define that, but I think that one relevant target group is truck manufacturers. They are probably already well aware of the potential benefits of these technologies. However, we have done calculations that are at an average level for an average ton kilometer and they might be working with more specific customer cases and more case specific analysis. Therefore, we could provide more on how the economics of a long-term average perspective might look.

If we think of industry more as transport related actors in general, both public and private, then it is important to know how this new technology will change the economics of freight transport, since it might change the game. For instance, there are a lot of policy initiatives to promote rail transport and to shift freight from road to rail and sea; the automation of trucks shifts the economic incentives in the complete opposite direction.

What further research could this lead to?

For us, the main motivation for this paper was that we want to be able to simulate how a future transport system with driverless trucks could look. In the models we have now that are driven by economics, the most important input parameters are the cost of operating a driverless truck vs. operating a manual truck. We don't need to know it in absolute values, but we need to know it in proportion, in relation to each other. So, will it be 5, 10, 15, 40% cheaper or more expensive.

So that is something we are working on right now, to run these simulations and then we can start to get some glimpses into what the implications of driverless trucks might be. For example how much more road freight transport will there be? How will driverless trucks compete against and complement rail transport and sea transport? And for what different types of freight transport flows will road transport be more competitive or less competitive? Because it might change the structure of what types of goods are transported on train, on sea, on road, we can do some analysis on different types of goods and different types of freight transport. So that is one obvious next step in our research.

Then there are a lot of studies that can be done more specifically on the economics of driverless trucks by digging deeper than what we have done. We have done all calculations on an average ton kilometer i.e moving one ton kilometer for an "average" manual truck compared to an "average" driverless truck. In reality, the cost savings depend on the transport case; how you load the goods to and from the truck and other factors that we did not consider much in this study. But we will focus now on the simulations and on using our results for that.

What is the take home message of the paper?

The main message is that there is a potential that driverless trucks make road transport way cheaper than today. Somewhere in the range of 30-40% cheaper per ton kilometer; and that is a dramatic change that will have many secondary implications.

You can read Albins's full research article here, or feel free to contact Albin for more information.

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