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Stephen Redican and Cindy Zhang in conversation with Barrie Kirk, P.Eng. Executive Director, CAVCOE

Connected and Autonomous Vehicles (CAVs) will change people's lives in many ways, some of which remain unimagined but certainly not impossible.

According to Barrie Kirk, executive director at CAVCOE (formally, the Canadian Automated Vehicles Centre of Excellence), 2020 is not that different from 1908, when mass production of Model T Fords began. Henry Ford was a great inventor and entrepreneur, but it is likely that he did not foresee the impact and changes his commodity of cars would have on individuals, cities, infrastructure, businesses and governments.

In the present day, according to Barrie, we are going to see the same degree, breadth and depth of disruption in the next decades from the deployment of CAVs, similar in size and magnitude to what occurred following the launch of the Model T Ford.

In this installment of *The Sensor*, our discussion focuses on the real expectation that CAVs will fundamentally transform the modern vehicle experience in the coming generations regarding everyday purchases or financial services.

Similar to the future of CAVs, the future of financial services, and in particular payment systems, is dependent on new technologies and a digital-first approach. From the implementation of payment system modernization in Canada to the ubiquity of FinTech payment service provider behemoths, digital innovation in the payments industry is happening at a quicksilver pace.

Success in this connection for the CAVs industry depends on understanding and harnessing its power and planning for what's next. At the same time, upcoming regulatory change in Canada for payment service providers, coupled with the advent of open banking and underscored by ever-present and evolving cybersecurity and privacy concerns, makes this a challenging time for the payments industry. What is certain is that with a widening array of choices for businesses and consumers and an unprecedented number of innovative market entrants and new service offerings, traditional payments models will face significant disruption as CAVs come online.

The COVID-19 pandemic and corresponding need for social distancing have only accelerated the digitization of services across virtually all sectors. In particular, it has driven home the need for financial, payment and banking services to be provided remotely or in a contactless way.

Barrie, who describes himself as a futurist with a passion for history, discusses his thoughts on the exciting intersection of new developments in CAVs with the future of payments systems. In particular, we focus on various use-cases and the possible technologies and potential paths forward for collaboration in the automotive and payments industries.

Entities and stakeholders involved in the development and provision of CAVs will need to consider obligations arising from regulatory oversight and legislative prescriptions applicable to them. These entities would include CAV suppliers and manufacturers, as well as FinTechs or financial institutions who partner with CAVs to provide payment and financial services to the vehicle's owners or operators.

At a broad level, for example, if a CAVs stores its owner's banking information, authentication or identity verification measures, then such information will need to be protected if the vehicle is stolen or hacked. Will insurance schemes account for the risk allocation involved with partnerships between CAVs and payment and financial services providers, or will contractual liabilities suffice?

Another key trend is that the expected arrival of robo-taxis will erase the traditional one-on-one relationship between a car and one or more humans. Given the higher price points of CAVs today compared to non-connected vehicles, it is likely we will see more prevalence of CAVs in the context of robo-taxis or the sharing economy before individual ownership.

In the realm of payments, a number of industry prognosticators have already been discussing and considering various services that could be offered relative to CAVs. These range from payments for external services while using the vehicle (*e.g.*, food and beverage drive-through, fuel purchases, EV charging, car washes, toll road use or parking), or payments for in-car services while operating the vehicle (*e.g.*, mapping/traffic applications (which are currently free) or streaming services for news or entertainment). Many are also talking about fleet management use-cases, where currently a payment card is issued to a vehicle, not a person, and the vehicle operator uses the payment card associated with that vehicle for payments related to use of that vehicle (*e.g.*, for fuel, EV charging, service or maintenance).

There are also other potential more remote use-cases. For example, payments by or in respect of the vehicle itself when in autonomous mode and taking itself to a dealership for service, picking up groceries or even operating as an autonomous taxi and accepting payments for service. In this article, we are focusing on non-autonomous but connected payments, though it is possible that autonomous payment methods may not be much different than non-autonomous ones.

Barrie Kirk joins us in our first conversation about the matters above.

In discussion with Barrie Kirk

1. Question: What are the major ways that CAVs will change financial services?

Answer: First, the banks' car loans market will be disrupted because the trend to robo-taxis will result in fewer cars being sold, leading to a smaller market for consumer car loans.

Second, the auto insurance market will be disrupted: the number of collisions will decrease substantially. Also, the reduced number of consumer-owned vehicles will lead to fewer consumer insurance policies.

Third, vehicles of the future will be far more connected. Empty cars will drive themselves to a charging station, plug themselves in and pay. An interesting question is whether a fully autonomous car with artificial intelligence comparable to human intelligence will have its own bank account?

2. Question: In Canada, the average daily roundtrip commute by car is 56 minutes. The clearest advantage of CAVs for commuters is making the daily journey more productive, enjoyable, or both. Nevertheless, do you anticipate the increase in remote working and the growth of sharing economies as it relates to cars – and even the increase in demand for bicycles – to slow down public interest in CAVs? If not, why?

Answer: Cost savings are the primary motivation for people to move away from car ownership and use robo-taxis. This is true regardless of whether commuting levels go up or down. I expect a significant increase in the use of robo-taxis in the years ahead. In October 2020, Waymo announced that it was starting to offer a fully driverless taxi service to the general public in Phoenix, AZ. Significantly, there will be no safety driver. This means that the first generation of robo-taxis has arrived, although initially, there will be limited capability and limited deployment.

3. Question: Among any possible use-cases or methods, including those listed above, which do you see as the most likely to be introduced or succeed? Which do you see as least likely to be introduced or succeed?

Answer: There are two main segments to the CAVs ecosystem: passenger CAVs and non-passenger CAVs. The early deployments will be robo-taxis in downtown areas that are geographically constrained and have been subjected to HD mapping. I also expect to see a broad deployment of non-passenger CAVs for sidewalk winter maintenance, deliveries to homes and businesses, farming, mining, construction, etc. These use-cases are easier to deploy than passenger CAVs because the safety issues are easier to address. I do not expect to see the ultimate form of passenger CAVs, defined as go anywhere, anytime, in almost any weather, until we are well into the 2030s.

4. Question: What technology will be used to make the payment? For example, will it be contactless with some sort of broader-reach near-field communication (NFC); will it be dedicated short-range communications (DSRC) or will LTE or 5G technologies be used?

Answer: There is currently no consensus on this. However, I expect 5G will be a strong contender because it will be ubiquitous. The low-latency, high-speed and short-range features of 5G will make it attractive for payments.

5. Question: How will payments work? Will they be handled through an operator's mobile device or wallet? Will the vehicle become or host a mobile wallet (*e.g.*, will the payment credentials be stored in the vehicle)? Is there a handoff and related data exchange between the mobile device/wallet and the vehicle when an operator enters a vehicle, or will payments be handled in some other way? Or will all these different payment models be brought to market? If so, in your view, which will be the winner and why?

Answer: It is too soon to tell. I expect that there will be an ecosystem with multiple stakeholders, just as there is for today's payments system.

6. Question: Will vehicle operators need to verify purchases (*e.g.*, on a screen in the vehicle), or is it possible that authentication and verification will be automatic and tied to geolocation, condition of the vehicle (*e.g.*, is it low on fuel or due for service), payment history (*e.g.*, time, amount, frequency) and other operator or vehicle data?

Answer: We need to differentiate between purchases made by a human and those made by the vehicle itself. I expect that a human-generated transaction will need verification. Perhaps using voice or facial recognition systems. A transaction initiated by the vehicle will need to be secure, but no human authentication will be needed. And if the vehicle is driving with no human on board, then human authentication will be impossible unless done remotely.

7. Question: Can you see greater potential for loyalty or reward points tied to use of certain retailers (*e.g.*, fuel stations)? If so, which ones do you see as most prevalent or possible?

Answer: Loyalty programs will be disrupted and will need to change. Robo-taxis will be owned and operated by companies offering Mobility-as-a-Service (MaaS). The percentage of vehicles owned by individuals will therefore decrease, so loyalty programs targeted to vehicle owners will become less relevant. However, loyalty programs for MaaS providers will become very popular.

8. Question: On a broader "Internet of Things" point, do you think payments and CAVs will be connected to other devices (*e.g.*, a connected refrigerator), that orders groceries when running low on staples and sends the vehicle to the grocery store to pick up and pay for the groceries? If so, using this example, would the refrigerator be the payment system, would it be the vehicle or would it be a combination of both (or neither), possibly using a cloud-based solution? Are there other examples?

Answer: Ordering and payment systems will become more automated and interconnected, just as you described. There will also be non-passenger CAVs that are used for delivering parcels and food, which will be an alternative to passenger CAVs being used for deliveries.

An example of another use case is that robo-taxis will be able to drive themselves to service points to be cleaned, maintained and have the battery recharged – and then pay for everything.

9. Question: What will be the ubiquity of the "operating system" (thinking in terms of iOS vs. Android)? For example, will vehicles from different manufacturers be able to "talk" to fuel pumps/charging stations from different providers at different fuel stations?

Answer: Let's differentiate between operating systems and communication standards.

Each company will likely have its own vehicle platform specifications, including the operating system. But there will be industry standards for communications between the platforms, just as there are now. Today, emails can be exchanged between Android, Apple, Microsoft and other devices. Standards exist for FTP, HTTP, etc. The global 5G Automotive Alliance (5GAA) is also working on standards and best practices.

10. Question: On the potential issue of disintermediation of banks and other traditional payment service providers by OEMs and FinTechs, do you have a view as to who will be responsible for the payment flows? For example, will it be a transaction sponsored or provided by an OEM, financial institution, payment network, electronics manufacturer or e-wallet provider?

Answer: I don't know. But given recent history, I would expect non-traditional payment companies will see business opportunities and enter the market.

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