The convergence of the technology and automotive industries led by industry disruptors like TESLA, Google, Blackberry and Uber, often in collaboration with traditional vehicle and parts manufacturers, is driving the acceleration and deployment of technology in connected and autonomous vehicles. Today's vehicles already contain significant levels of automation, including millions of lines of code and perhaps unquantifiable levels of data and personal information. These new technologies promise many benefits, but also raise several concerns.

Among the benefits often cited are:

- improved safety from a projected decline in vehicle collisions and fatalities;
- environmental benefits from reduced congestion and therefore reduced fuel consumption and pollution associated with idling cars;
- human and social benefits by facilitating access, inclusion and greater engagement in social, political and economic life for all segments of a community regardless of the demographic;
- potentially astronomical economic benefits forecasted to be in the billions of dollars annually as a result of savings attributed to collision avoidance, fuel cost savings, congestion avoidance and heightened productivity, among other factors.

Among the concerns often cited are:

- high employment displacement and job loss in certain industries;
- privacy and mounting concerns around data ownership, use, storage, monetization;
- cybersecurity breaches and appropriation of data and personal information by hackers;
- urban reform. Autonomous vehicles are expected to change the way our cities grow and develop. An urban densification model envisions land currently used for parking lots and garages being reclaimed for housing and commercial purposes; whereas the urban sprawl theory assumes that people will leave the city, purchase larger homes in the suburbs and tolerate longer commutes if they can be productive during their ride into work;
- infrastructure spending – who will fund the development and maintenance of the new “smart cities” required to support the deployment of transformative technologies? Taxpayers? The private sector?

It is the rapid arrival of these benefits and concerns that is raising significant and challenging legal and ethical questions for policy makers, lawyers, industry leaders and consumers alike. Technology is outpacing policy and regulation. In order to accelerate the regulatory reform required to permit the deployment of responsible technologies, policy makers and industry must work together to address the critical legal and ethical issues currently impeding innovation, these include:

- laws and regulations: enacting legal and regulatory standards that will facilitate innovation while also ensuring our safety and security;
- product liability: determining the appropriate allocation of risk and liability;
- privacy: establishing a framework around data ownership, use, access, storage, protection;
- cybersecurity: developing safeguards to protect against nefarious players;
- intellectual property: developing a framework that recognizes, protects and enforces intellectual property rights grounded in artificial intelligence and related emerging technologies.

While all new technologies involve some level of ethical deliberation, in the realm of autonomous vehicles...
numerous studies have produced reports predicting that autonomous vehicles will dramatically reduce the number of traffic accidents and fatalities, however, no study suggests that autonomous vehicles will eliminate all accidents. Therein lies the primary ethical dilemma with autonomous vehicles. In those rare situations where an accident cannot be avoided, how will or should the autonomous vehicle be programed to react? And who should be responsible for the consequences that flow from that programing decision? This scenario is known as the “trolley problem”, an experiment first conceived by philosophers to assess the moral instincts that may underlie a person's decision about the most ethical course of action.

the classic trolley dilemma involves a trolley barrelling down the track on a collision course with five people, unless the driver pulls a lever to divert the trolley onto another track where it will kill only one person. the experiment exposes the moral tension between allowing versus actively committing a harm. is it ethically preferable to kill one in order to save five? or should you allow five to die instead of deliberately killing one? in the autonomous vehicle context, there are many more permutations of this scenario, many more variables, choices and uncertain outcomes at play that make taking a decision in such a scenario far more complicated. human drivers caught in similar “no-win”, “do or die” situations will instinctively make a split second moral choice, and if that choice results in a terrible accident, we tend to be understanding because we recognize the human frailties involved and the enormous pressure of making such a decision in the heat of the moment. autonomous vehicles however, operated by a machine, are viewed and judged differently because they do not have any human frailties, and are programmed in advance on how to respond to such situations with the benefit of full deliberation. but does that really make the decision any easier for the programmer or manufacturer?

germany was the first country to attempt to answer these challenging ethical questions. in 2017, it released a report listing twenty guidelines for the motor industry to consider when developing autonomous driving technologies. in short, the report held that self-driving cars should always attempt to minimize human death, there should be no discrimination between individuals based on age, gender, race, physical attributes or any other factor, and human life should be prioritized over animals and property.

studies report that most people are generally comfortable with the utilitarian approach proposed by germany. that is, until they are personally seated in one of these vehicles, in which case, the majority then elect to protect themselves and their passengers above all else. these findings suggest that while people may think ethically in principle, in practice, they are self-interested, especially when they are not in control of a situation. therefore, while it may soon be possible to program machines to act like humans and make ethical decisions, the question is, do we want that? conversely, if we adopt a more dispassionate, utilitarian approach, who would buy a car that is programed to kill its occupants in the event of an unavoidable collision?

from a liability and insurance perspective, how would responsibility be allocated? today, a driver will apply his/her judgment and common sense to override the black letter of the law in order to respond to an emergency or unforeseen situation. a person is found negligent if they did not act as a reasonably prudent person would have acted in similar circumstances. based on that standard, the “reasonable robot” would have to meet or exceed the expectations of the reasonable person. from a product liability perspective, this should be no problem as autonomous vehicle will be equipped with all the
sensory information required for every decision they make, and in those rare occasions when an accident cannot be avoided, we will be able to pinpoint the exact cause of the accident and the corresponding developer, programmer or manufacturer responsible for that component not performing as intended.

However, in morally ambiguous trolley like scenarios, robots cannot independently decide how to follow the law, allocate risk and mitigate loss. For autonomous vehicles, it will be up to the developer or manufacturer to decide *in advance* when a certain feature should be triggered or when the law should be broken. This will necessitate someone, somewhere making a moral judgment.

The challenge, in navigating this brave new world, will not be in enacting new laws, but rather in enacting laws that appropriately balance macro and micro legal and ethical considerations. From a macro perspective, we may have an ethical imperative to ensure transformative technologies, like autonomous vehicles, are implemented on account of the many benefits they will deliver. However, from a micro perspective, we may wish to avoid hard coding every decision to eliminate human control or choice, particularly those that directly impact our personal safety and security.

- To learn more about the legal risks of adopting artificial intelligence in business, see: https://www.mccarthy.ca/pubs/From_Chatsbots_to_Self_Driving_Cars_White_Paper_SEPT2017.pdf
- For a summary of autonomous vehicle regulation in Canada and other select jurisdictions, see the link here https://communications.mccarthy.ca/42/205/uploads/the-road-to-av-regulation-in-canada.pdf

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