FORMForum 2016: Opening Address

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Summary

This is a record of the opening address for the meeting.

1 Welcome and Introduction

Good morning ladies and gentlemen. Welcome to the European Automotive Research Partners Association (EARPA) Autumn Meeting, 2016, the FORMForum. My name is Simon Edwards, I currently have the honour of being Chairman of the organization. I have been working in the Automotive Industry now for about thirty-five years, most recently with Ricardo, mostly in relation to powertrain and vehicle technology. However, I have a feeling, may be you have the same, that I have never experienced so much change, such a great rate of change as we have in the industry at the moment. For researchers, like the majority of us here, a high rate of change makes life interesting, presenting ever new opportunities for investigation, discovery and innovation. However, such a rate of change also makes predictions for the future, the creation of which is always a precarious proposition, even more difficult, more prone to errors. And so, I am really looking forward to the papers and discussions we have today about the Future of Road Mobility (FORM). However, I would to take a few minutes to set the scene, to present perhaps a personal vision of the future, and raise some of the questions that hopefully we start answering today.

2 A Very Brief History of Mobility

The history of personal mobility, latterly mechanized personal mobility, is as extensive as the history of modern mankind: it is also a history of continuous change. Apparently we used the shoreline and the waterways to move out of Africa through our first wave of globalisation 70 to 10 thousand years ago (see Fig. 1) [1]. Clearly, we were helped in the later parts of that journey by the donkey, the ox, the horse, the camel, the lama and, probably, the elephant [2]. We left the inland waterways and the shorelines as we extended trade and logistics around the globe: and with that came research into accurate, mechanized chronometers, which resolved the route finding (and recording) problems related to longitude [3]. However, it was not until the introduction of the railways, during the early 19th Century, that the age of mechanized mobility really began (see Figures 2 and 3) [4]. Interestingly, the research and development into this transport (as well as into the clock mentioned before), e.g. Stephenson’s Rocket from 1829, was encouraged through the use of competition and prize giving, in Stephenson's case the Rainhill Trials, an early form of “grant funding”. With the

railways came urbanisation and, with time tables, the need for a national standardisation of time. Clear examples of the impact that developments in personal mobility have on societal developments.

But each of these changes is also often associated with an infrastructural change, shipping followed the natural infrastructure of the “trade-winds”, but clearly the railways brought their own, opening up world to further rapid development [4]. Similarly, the bicycle boom of the late 1800s was supported in part, enabled if you like, through the development of roads (essential for EARPA!) covered in “tarmacadam” [5] (one of the consequences of the wider discovery and use of oil: although tar had been applied in road building already for almost 1000 years in the east). This boom presaged the development of the automobile, building on the research of Lenoir, Otto and Diesel, and the innovations of Daimler and Benz, supported by a network of road-side filling stations, to form the industry we are now part of. And, if we continue through the transport modes, our airlines follow “infrastructure in the sky”, predetermined flight paths and air traffic control systems, whilst, at the same time, our airport locations (in some countries at least) are determined following a hub-and-spoke model: a (wonderfully) wheel based analogy for our winged transport.

But I must come back to the ground and consider road transport some more. Personal mobility took a great leap forwards (to mix my metaphors again!), with the introduction of mass production by Henry Ford with the Model T in 1908. This really did allow gasoline internal combustion engined transport for the masses, it lead to sub-urbanisation of the cities if you like. It helped create the one of the largest industries we have in the world, by some measure the largest in Europe, and lead to the development of multiple new technologies, particularly in the application of modelling then simulation, and industrial practices such as quality control or lean production. However, as we know, its success has also brought difficulties for society, and the aspects of safety, noise, air quality and energy efficiency have each been and continue to be successfully addressed by research and innovation coming from the industry, often supported by government initiatives. Changes related to one or more of these aspects have been central to my personal automotive career throughout the last thirty-five years.

3 EARPA and The Digital Road Ahead

As I have been talking, I have been careful to speak about transport as the multifaceted system that it is but also identify specific aspects related to EARPA’s activities: I have mentioned the internal combustion engines and fuels, modelling and simulation, logistics, aspects of manufacturing and materials, urban mobility, noise, safety and implied the use of hybrid and electrical systems through their impact on energy efficiency. What I have not yet mentioned is electronics and communications. The geologists have just about agreed that we now live in the Anthropocene. For me, thinking about things more in societal terms, we are clearly moving from the Industrial Age to the Information Age. Which does not mean that industry plays a secondary role, more that the rate of change of society is now more determined by the rates of changes

in all aspects of information rather than industry: Just as the growth in the Industrial Age was initiated by the availability, the generation and transfer (transport) of energy, so it is in the Information Age that the rate of change is determined by the availability, the generation and the transfer of data, information, knowledge and, perhaps at some time, wisdom. It is interesting to note that it was only with the first electrical telegraph, in the 19th century, that the speed of long range extensive communication over took the speed of transportation (if we put aside smoke signal, flag flying and fire beacons). And the second major change in the rate of information communication, came only in the 20th century: the enabler for this is, of course, digitisation in all its forms, on the back of electronics and (mobile) communication systems. So I am pleased and sure that the digital world will be a major theme for our discussions today. The current road vehicle itself is probably the most complicated single piece of transport equipment, when measured by the metric of “lines of code” (see Figure 4). And, when multiple vehicles are linked together into the transport system then we will need the all projected developments in computing power over the next decades, to ensure inter-operability and the functionality that enables, to keep it all running smoothly.

4 The Future of Road Mobility

But how does this all then relate to the future of road mobility, in the future transport system in a future society? Clearly, there are megatrends that are reshaping the world that we live in, such as the increasing population and its urbanisation, which will drive new requirements, behaviours and implications. For transport, the aspects of energy efficiency (minimum energy used per person/ton.km), congestion, safety & security, connectivity and environmental pressures may result in automated, on-demand yet human centric mobility, with new vehicles, technologies, business models and personal practices: managing the process of getting from A to B “painlessly”, whilst the rest of the densely populated location (and its goods) is getting from B to A, or B to C and so on. This will be supported by an energy system that is affordable, efficient and has low carbon energy supply: this will require long term investment and an integrated energy policy, in which the needs, societal and infrastructure, for mobility and road transport (e.g. the equivalent of EV and H_2 "filling stations") are accounted for. Finally, demand for resources will lead to new ownership and leasing models, new industrial practices that recognise resource value and drive the “Circular” economy, such that hopefully we can push back the resource overdraft that we, globally, draw each year. All of this is represented in this one image shown here (see Figure 5).

5 The FORMForum 2016

Clearly, such a future vision is just that, a vision, and is inherently personal. But in striving towards it, even just to individual aspects of it, as you will hear today, the EARPA members, the partners within their collaborative research activities, are taking steps in the right direction. Steps to answering questions, when we think about digitalisation as the biggest trend today, such as:

- When will the computing power in a vehicle and associated with its use (e.g. server farms) be consuming more energy than that relative to the motive force on the vehicle?
- And, if that has come about, what about the other vehicle systems, for example the cooling, especially in relation to the powertrain cooling and the cabin conditioning?
- And when will "data quality" become as important as "air quality" is today?
- And, if we achieve that, when will virtual vehicle validation be more important than "on-road testing"? Perhaps here you say we are already there, but then the question can be reposed: when will the first vehicle be introduced that has been validated and certified only in the virtual world?
- Or, if the vehicle ownership and usage model is so different from today, what will the vehicle (and component) durability (and their validation) requirements look like?

And I hope in learning about those steps, listening to the ideas of the young researchers, that your vision will take a more substantial form, and that the activities of EARPA's members, at the early technology readiness levels (TRLs), through grant funded cooperative research and innovation, will be recognized for the value it is, for society and for the automotive industry in all its aspects.

6 References

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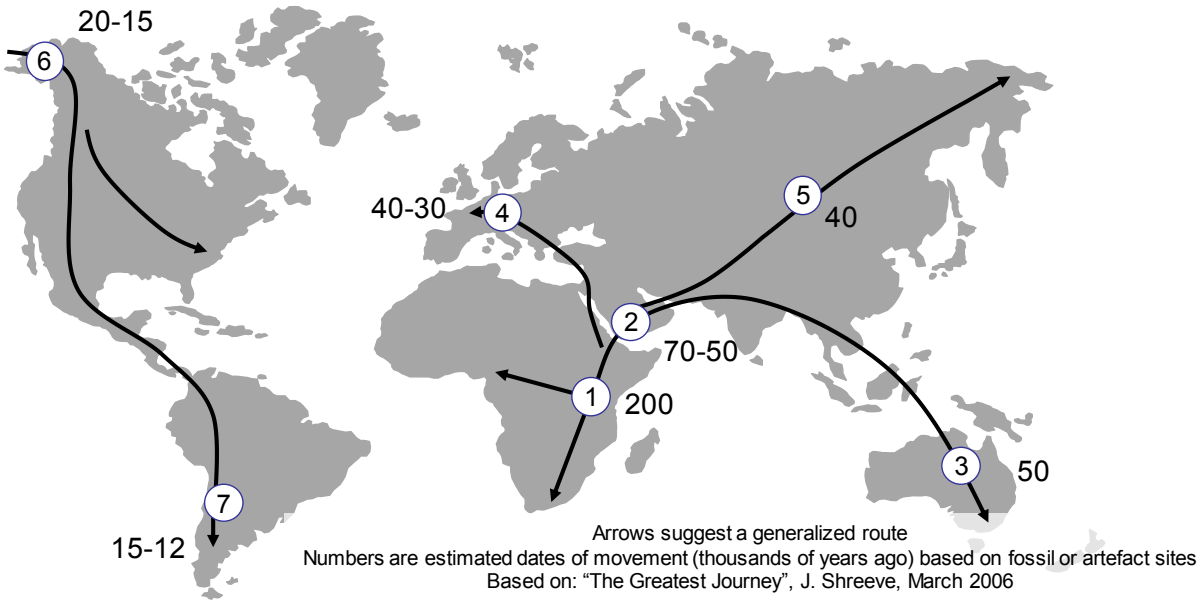
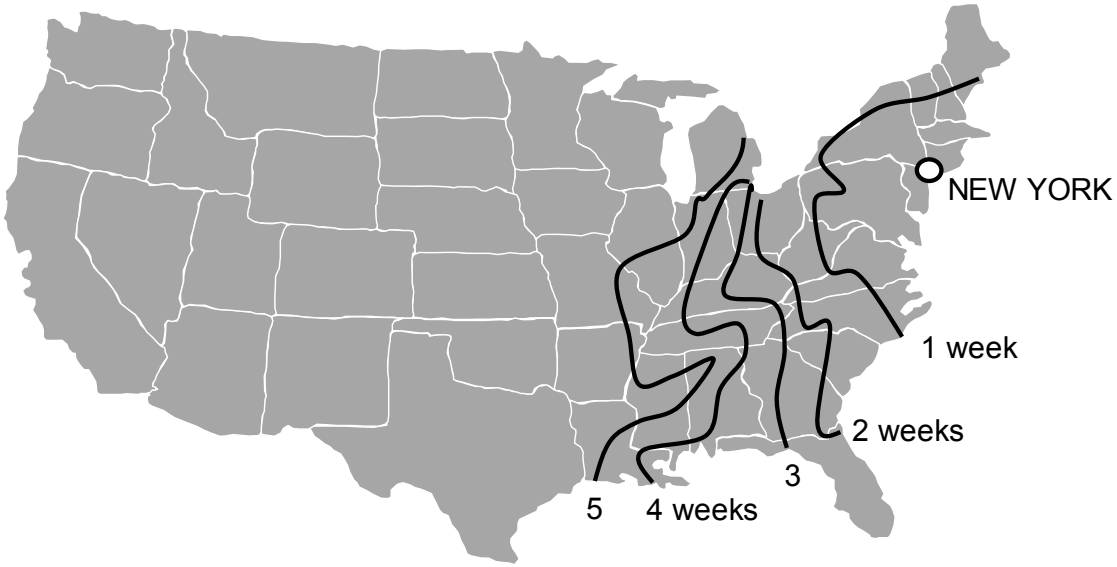
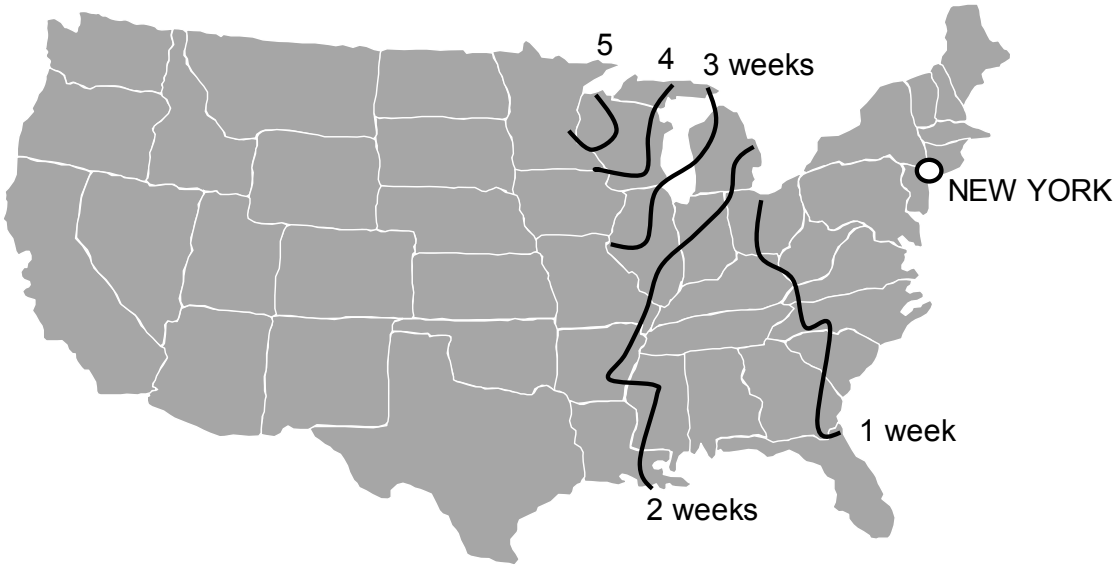


Fig. 1: The Movement of Humankind from its Outset [1]

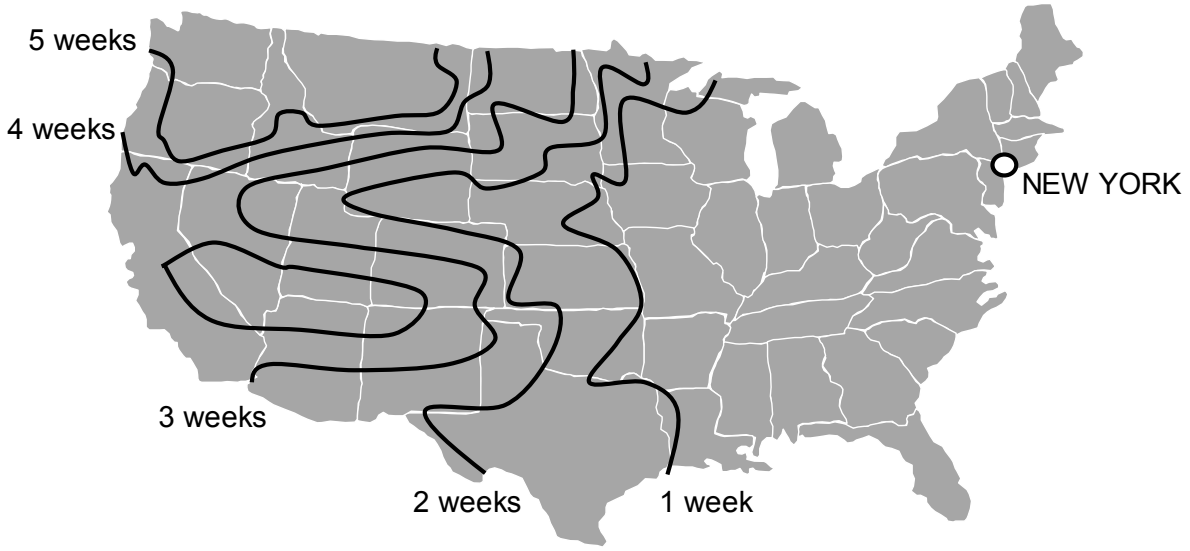


Time Taken to Travel from New York in 1800
Based on: "Why Information Grows", C. Hildago, 2015

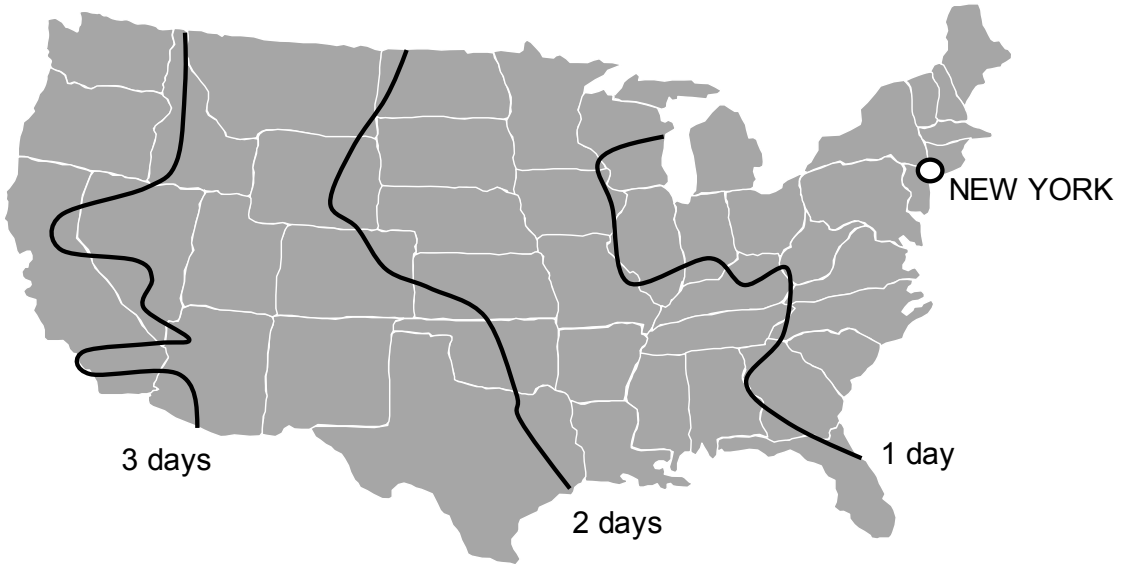


Time Taken to Travel from New York in 1830
Based on: "Why Information Grows", C. Hildago, 2015

Fig. 2: Rates of travel during the early 19th Century in North America [4]



Time Taken to Travel from New York in 1857
Based on: "Why Information Grows", C. Hildago, 2015



Time Taken to Travel from New York in 1930 (by Train)
Based on: "Why Information Grows", C. Hildago, 2015

Fig. 3: Rates of travel in the later 19th & early 20th Centuries in North America [4]

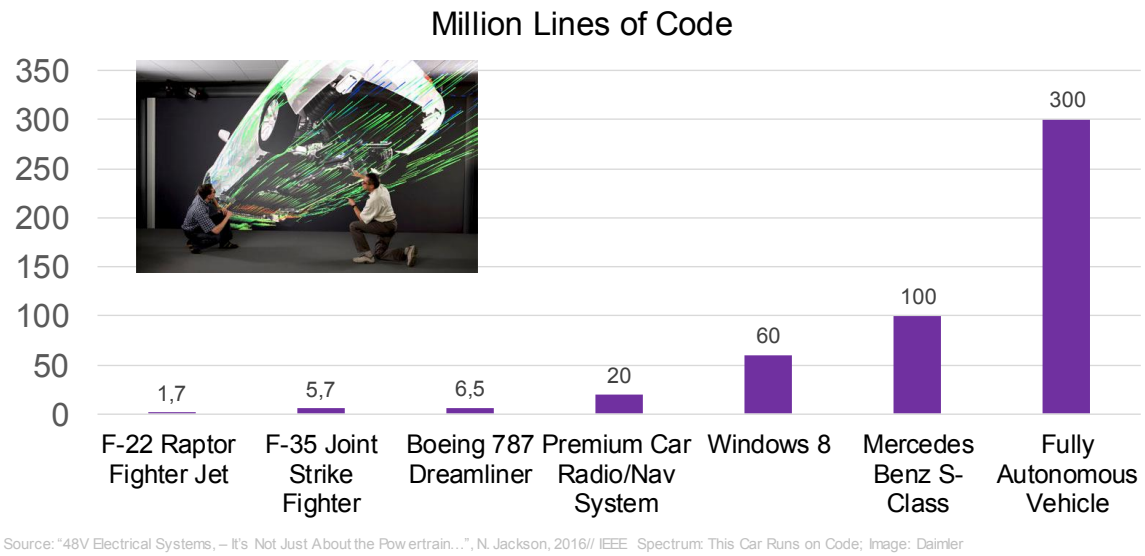


Fig. 4: The complexity of automotive software

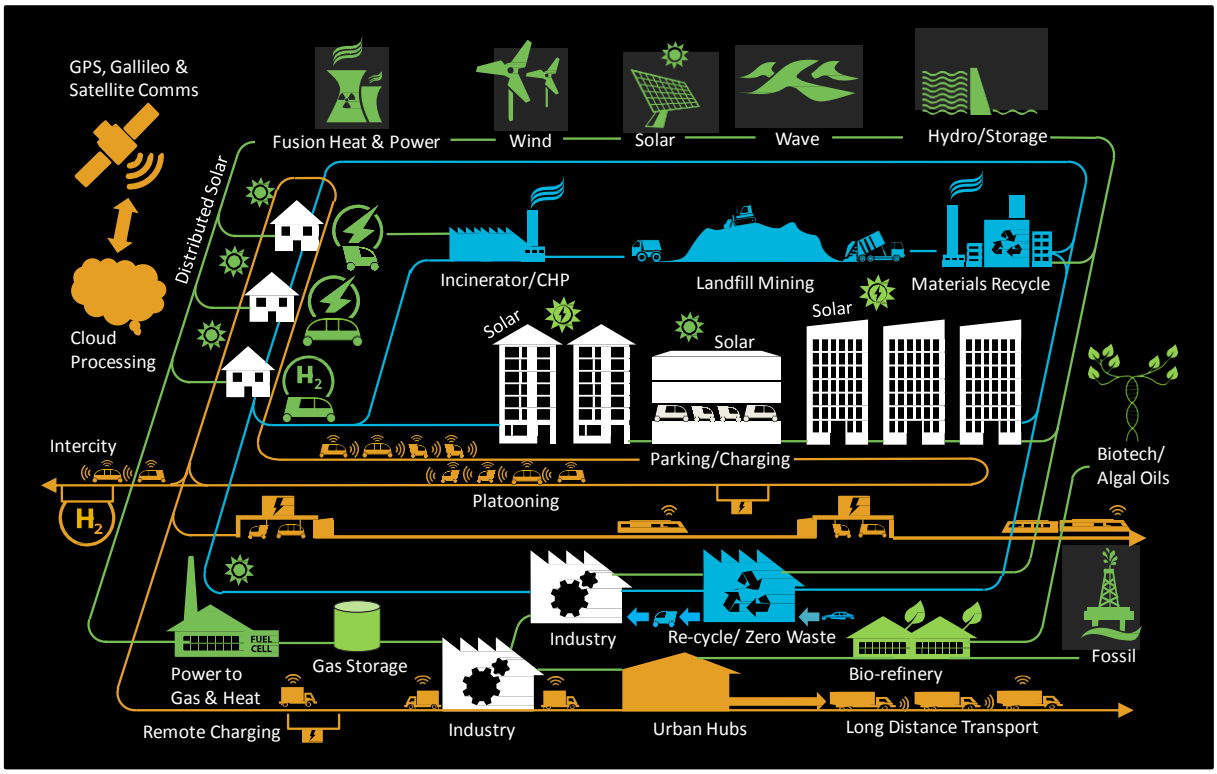


Fig. 5: A composite future vision of mobility within society (Ricardo)