

Thoughts arising from a reading of “Re-imagining the Railway” by John Dora and John Beckford

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May 2014

In a recent paper, entitled “Re-imagining the Railway”, John Dora and John Beckford provocatively set out a series of suggestions for the future of the UK railway¹. It is well worth a read by all those concerned with our railway system, and I find many of the arguments they make both persuasive and attractive. In essence they suggest that the railway should operate as a “system” with the prime purpose being

“to move people and goods to and from locations on the system”.

Perhaps most significant for the short term is that when the current round of franchises end, Dora and Beckford propose they should be replaced by management contracts. They write

“If rather than in competition with itself, the railway is viewed as being in competition with alternative modes of transport then ‘lines of route’ could be let on a management fee basis. This would mean a management contract in which the operator is funded at a set level while earning a premium in relation to those characteristics of performance which are deemed most important. Fares and grants would be offset against the funding level.....A simple regime that provided for a break-even management fee with bonuses for on-time performance, reductions in cost per train mile and reducing carbon emissions might be more effective.”

For this reason alone, I think the paper is an important one and should be required reading by politicians of all persuasions and colours, particularly as policy formation in the run up to the next general election is underway. However, it is a consideration of two other issues that Dora and Beckford touch on that I would like to take forward in this essay. Firstly, Dora and Beckford address the issue of the long term nature of both rail vehicles and infrastructure investment with design lives of many decades or centuries, and how this has a tendency to create inflexibilities in the overall system. The second issue is implied in the second of the above quotes, where railways are seen as being in competition with other modes, and the system boundary drawn around the railway system, excluding other forms of travel. I would like to see this boundary drawn more widely, with all forms of transport contributing the mobility of passengers and freight being seen as the system. In what follows I will offer some thoughts in both these areas, in the hope that it may contribute to the ongoing debate.

Firstly let us consider the long term nature of the rail industry. Dora and Beckford rightly note that the expected life of railway vehicles is at least 30 years. The period between major infrastructure renewals is of a similar nature, and there are of course some pieces of infrastructure that have been in place for 150 years or more. This can make for considerable inflexibility, particularly where there are strong interactions between infrastructure, vehicles and operation, where major changes in one cannot take place without major changes in the other. This inevitably leads to a major degree of conservatism that inhibits innovation. I would suggest that the way forward here is to move towards a railway where the infrastructure, vehicles and operation are largely independent of each other,

¹ Dora J, Beckford J (2014) “Reimagining the Railway”
http://www.iohdoraconsulting.eu/JDCL/Uploads_files/Reimagining-the-Railway-VF.pdf

with well-defined and agreed boundaries and interactions. This would allow major innovations in, say, traction power, without necessarily having to change track and signalling systems. Specifically I would make the following proposals, which follow on from suggestions by Dora and Beckford.

- There should be a move away from overhead and third rail electrification supply – as Dora and Beckford point out such systems are inherently vulnerable to weather, theft etc. – and that all traction power should be on a traction unit (a.k.a. a locomotive!). Dora and Beckford give an electricity generating, hydrogen powered gas turbine locomotive as an example of such an approach. This would mean one of the major infrastructure components, the electrification system, could be discarded and a major infrastructure / traction dependency abolished.
- The infrastructure itself should be as simple as possible, essentially two tracks four feet eight and a half inches apart, and able to take trains of specified weights and sizes, and the corridor it occupies should also be seen as a conduit of national importance for the carriage of other services. Whilst I am a considerable fan of the humble chunk of railway ballast (first used in the early industrial revolution for north eastern mine railways, and now, well over two centuries later, still capable of being used on 350 km/h track systems), I would suggest that the track form of the future might be a concrete box, with rails on the upper surface, provision for robust drainage, and conduits for some or all water, gas, electricity, hydrogen, telecommunication cables etc., although some sort of risk analysis would probably be required as having some of these services in close proximity does not seem a terribly good idea! Also on the surface there could be a track for rubber tired vehicles – we will consider this further below. There would however be nothing concerned with train control – signalling systems, track circuits etc.
- Train control would essentially be vehicle based, with radio signalling and vehicle to vehicle communication. The technology for such systems already exists of course, although typically, as Dora and Beckford note, the risk-averse nature of the current railway operation makes implementation difficult.
- Vehicles themselves would themselves be of a number of self-contained forms. The current standard of interconnected multiple units with wired connections again makes for considerable inflexibility, with any changes in, say, traction, requiring completely new train sets. To my mind the most flexible mode of operation, when looked at on the long term investment time scale, is that of locomotive and coaches or wagons, although not as defined in the traditional sense. I would envisage locomotives of the type suggested above, with the ability to generate “clean” power from “clean” fuel, pulling self-contained carriages or freight wagons, each with its own braking, power, communication and, where necessary, titling systems. The vehicles would be connected by a nationally standard coupling and passenger connection, with tightly defined specifications, but all the control systems between the separate braking, communication and tilt systems in a train would be through wireless communication. A nationally agreed set of protocols would be required. The basic idea would be that as new designs were produced, they could be inserted into service with existing stock and infrastructure, as long as they conformed to the nationally agreed connection standards and communication protocols. I would go further and suggest that, for example, carriages, could be designed with modular systems for be upgraded during the course of their life, with braking, communications, power systems and seating arrangements, that could be changed as new designs were produced, with only the expensive underframe and shell expected to have a long design life – an idea hinted at in Dora and Beckford. I would thus envisage that most trains would consist of a traction unit at either end, with intermediate coaches, for both high speed and commuter systems, although the latter would have smaller, and shorter, traction units than the former. Indeed these formations could be long term arrangements much like today’s multiple units, but with medium and long term flexibility. For example extra coaches could be added as demand

required, and also, if necessary, extra traction systems, not necessarily at the end of the train. It would also eliminate traction motors beneath passenger compartments, but such a consideration is to let my own personal *bête-noire* intrude on the argument.

Thus to conclude the first of my two points, such an approach of minimising dependencies between infrastructure, vehicles and train control, would allow significant separation of the main components of the railway system, and could potentially allow greater innovation in the design of the separate sub-systems.

My second point concerned the line that Dora and Beckford drew around the railway as a system. I would argue that this is too restrictive to meet the modern concept of overall passenger and freight mobility, and that the system boundary should be drawn much wider around some sort of hypothetical railway system. Interfaces between different modes become much more important when the mobility concept is pursued. The need for easy passenger interchange is obvious and can be achieved through sensible design of stations and interchanges, although, sadly, this does not always happen even with new interchange designs. Further, I would suggest that railway control and information systems should be able to communicate with those from other modes – for example systems for monitoring bus movements, communications with taxis etc. This is probably achievable with current technology, but again agreement is required on communication protocols. In recent years there has been much work on the tram train concept, and a common control system would allow such trains to move seamlessly from street running to running on standard rail infrastructure.

Perhaps the major current development in transportation is that of autonomous vehicles. I have argued elsewhere that the implementation of autonomous road vehicles will blur the boundaries between public and private transport and between the different modes of transport². Here again, it would seem to me desirable for the control systems of autonomous vehicles to be consistent with train control systems, both to ensure appropriate interchange of passengers where required, but also perhaps to assist with a tighter degree of co-ordination. For example I could conceive of autonomous coaches using the rubber wheeled tracks in my proposed rail system (see above) for part of their journeys, effectively operating as trains in such circumstances. Similarly smaller autonomous vehicles, such as the Milton Keynes pods³, could be formed into convoys and use either the road or rail networks as appropriate. Such developments might be a long way off, but they might be of considerable benefit to passengers and should not be ruled out by an early divergence of control and operation systems.

No doubt there is a very great deal more that could be said concerning the ideas outlined in Dora and Beckford, but with the above thoughts I offer my contribution to what I hope will be an ongoing and constructive debate.

² C Baker (2013) "Driverless Cars – a threat to the future railway?"
<http://www.cbmiscellany.net/uploads/3/4/7/3/3473102/article.pdf>

³ Transport Systems Catapult (2014) "Low Carbon Urban Transport Zone (LUTZ)" <https://ts.catapult.org.uk/lutz>