

Introduction

This document has been prepared in response to the offer to provide input into the development of a federal infrastructure plan.

In reading this document you will see paragraphs header “Justification”. These are provided only to demonstrate that the ideas are grounded in the real world.

About the Author

Darren O’Connor has spent thirty years in Information Technology, with the majority of that time leading IT departments for publically listed companies all with significant supply chains. He has over 15 years experience in global retail supply chains, and has been awarded three industry innovation awards for supply chain solutions.

He has spent the last three years working in transport to solve some of the larger problems that have up to now seem in difficult to solve and increase the level of usage of good IT systems.

Together with Nick Busy, Darren O’Connor has a startup “Enfol” that provides a low cost on the fly track and trace of logistics units as they traverse both trading and non-trading partner transport networks.

He is also often called upon to speak at industry events on topics relating to IT in retail, transport, and supply chain.

Principles (Road Transport)

1. Field of Dreams “If You Build It, They Will Come”

If a road is congested building additional road capacity enables additional drivers to utilize it, which grows it’s utilization, until congestion returns. In a growth environment, it is only a matter of how long before this becomes true.

Note: The principle is only provided to drive discussion around alternatives to building additional capacity.

2. No Silver Bullets (and 1% improvements are worth it)

There is temptation in our current political environment to look for single simple solutions. Whilst these projects may be required it often overlooks a very large number of 1% improvements which taken together create significant impact.

Examples: Building tunnels, constructing large multilane roads etc.

3. Long Design Life, Staged Realisation

Strategic assets have a long term (>40 years) design life and any built form needs to adapt over time as the requirements change. The design must demonstrate how the proposed initial solution adapts to change and minimizes disruption as changes are implemented over time.

Justification: Melbourne's CityLink Tulla section has had significant disruptive upgrades which could have been avoided with a better planned, and executed initial build 18 years ago.

The nexus of road construction companies having a continuous income stream from road upgrades vs use by road users is currently biased toward the road construction companies and this needs Government to better represent road users.

4. Network Redundancy

There are many parts of Victoria with single access roads in and out. In an environment where fire and flood are significant natural disasters have occurred this has resulted in loss of life.

Any investment schedule must prioritise the provision of alternative access paths to enable escape in the case of a catastrophic event.

Note: The design of these is not just a case of provide a different path otherwise we run the risk of creating further congestion. (See Road Closures below).

5. Model Sensitivity Provided

All infrastructure project numerical models, no matter how well researched or developed, are approximate. Many have high errors or uncertainty in the prediction. Sensitivity analysis is to be included with significant projects.

Justification: Melbourne's Bolte Bridge (opened 1999) had had a significant design issue from day one with no planned model or process to correct it. Sensitivity analysis would be provided the impact of being out by a small amount.

6. Build Trust

Today most facts can be verified same day. In the near future most facts will be able to be verified in real time. The only thing of substance many organisations, including government, will have is the trust of their customers. Any project which reduces trust will have a negative impact.

Justification: We have had several cases in Victoria where Government Trust has been broken with significant negative consequences.

7. Genuine Stakeholder Consultation (also aligned to Trust)

All stakeholder consultation needs to be genuine. Without genuine consultation an excellent understanding of requirements cannot be reached and designs will always be inferior to that where the requirements of all stake holders are clearly understood.

Note: Community Engagement is not the same as Community Consultation, and is also not satisfied by just informing the community of a prior decision.

Justification: The community consultation of the Citylink Tulla Widening projects in Melbourne is best described as informing the community of a prior decision not consulting with the result of significant community opposition, Victorian Senate reviews, and inferior design (Bell St bridge).

8. Issues solved by Traffic Experts, with stakeholder consultation

Justification: Many existing traffic issues are referred to road construction companies with the result guaranteeing that it will involve constructing a road whereas there are significant examples of *road closures* being appropriate solutions.

9. Use of Road Infrastructure is considered.

Any infrastructure project must take into consideration the uses the road will be put to.

Justification: Melbourne's western distributor project the carriage of dangerous goods not being allowed in tunnels has been ignored.

10. Pre-existing Environment Requires Buffer Zones

The pre-existing built environment must be considered. Where significant assets (high speed roads, bridges etc) are to be located adjacent to schools, hospitals etc that buffer zones are created.

Justification: Under current legislation bridges of any height can be built immediately adjacent to school buildings.

11. Best Road Designs are the Minimum Required

Poor performing road design patterns are blocked from reuse. Excellent performing design patterns are established as the baseline so there has to be a significant reason to get dispensation to build a poorer performing asset (beyond just cost).

Justification: The Bolte Bridge exit to the South East is an example of poor design that replaced an existing poor design in the prior Tullamarine / Calder Fwy intersection adjacent to Essendon Airport with the net result of just moving the congestion further towards the city.

12. Physical / Digital Equivalency

All projects Have digital equivalent assets that are publically available that mirror the physical asset.

Recommended Initiatives

1. Digital Network

Digitization of the transport network. All future uses of our transport infrastructure are dependent on timely, publically available, accurate information on transport infrastructure.

The digital equivalent network provides (at a minimum):

- All signage along with a digital representation of the sign. (sign meta data)
- All road surface types
- All intersection restrictions (eg. no right turn, including hours of restriction)
- All road segment restrictions for the vehicle (speed, mass, length, width, height, class, axles), by lane, including any time/calendar based restrictions. Include any segments that require access planning, and control. Road closures, or downgrade of road service are to have validity periods to aid route planning.
- Road segment costs (Tolled, etc)
- All road content restrictions (freight, hazardous goods, class of vehicle)

In essence if it can be physically seen then it is represented in the database.

Provide the road base in both Australian Map Grid (GDA94) and GPS (WGS84) map grid bases to avoid small errors in translation.

Provide a mechanism for land developers, and other authorities to submit map updates as soon as the street names and alignments are known.

Justification:

(1) Today the parts of this information that are available from providers with highly restrictive licensing wording that blocks its use. (google.com for example).

(2) Data quality is poor.

Dynamic Roadbase Updates

In conjunction with signage manufacturers develop smart temporary signage that provides real time restriction information to the road database. Consider a temporary speed restriction sign being inserted into a digital representation of a road segment.

Encourage the vast reuse of this data, by providing research & development organizations funding to develop new uses including the development of route planning algorithms and make them freely available.

Land Parcel Linkage

Building on the G-NAF initiative link land parcel information to the G-NAF data. This will enable the rapid development of geofences to trigger arrival, onsite and departure states.

Road Usage History

For each time period by road segment historic traffic speed.

Enable other correlated data providers such as they Bureau of Meteorology to provide data aligned to the same time period.

Use all possible techniques and services to enable the capture of this data. Road sensors, road user hand held devices, road user, vehicle mounted devices, remote sensors, etc. To avoid any privacy issues insist the data be collected anonymously.

Current Road Usage

Provide current real time road segment traffic speed. Use all possible techniques and services to enable the capture of this data. Road sensors, road user hand held devices, road user, vehicle mounted devices, remote sensors, etc. To avoid any privacy issues insist the data be collected anonymously.

Mathematical Models

There are many areas of transportation where the models and algorithms we have today are poor and require improvement. These are opportunities for Australian companies to develop services around but they require the data to realise them.

Areas are:

- Congestion Modelling (and prediction)
- Congestion Avoidance Algorithms
- Dynamic Route (Multi-Stop) Planning Algorithms

Routing solutions when implemented in transport network with exposure to complex road network (Melbourne / Sydney) have significant positive productivity improvements. (in the order of 10 – 20% per day) which has the net effect of reducing the road occupancy time for a vehicle per day. These vehicles are often significant users of the road network and

removing them from the roads will have a significant positive road utilization and transport productivity impact.

Road Closures

Using the digital model and road utilization data above identify where permanent road closures would have a positive impact.

See: https://en.wikipedia.org/wiki/Braess%27s_paradox

Known Best Practices Not Implemented

There are many known best practices that are not wide spread or commonly implemented. These represent the existing low hanging fruit of productivity improvements.

I do not accept the position that all the low hanging productivity improvements have been implemented. There is always something which can be done.

2. Auto-Identification

It is currently widespread practice to NOT label freight with automatically readable labels including the now 40 year old humble barcode. Yet the benefits of this are well known.

Even where barcodes are used they are not standards based and globally unique.

There are several not for profit organizations, one global – GS1, and the other focused on North America (ANSI-MH10), who control identifier assignment.

There are restrictive terms in GS1's agreement that restrict data service providers issuing globally unique identifiers which limits the use of creation of identifiers to members of the association.

I encourage our Federal Government to work with GS1 to develop products and services that enable the widespread practice of labelling all consignments with globally unique standards based identifiers.

The Federal Government are a significant purchaser of goods and services which arrive via thousands of individual supply chains. Encouraging these agencies the insist on the use of auto-identifier technology and globally unique identifiers within government supply chains would push the use of this technology into the broader transport industry whilst enabling direct benefits to government.

Cost is no longer a barrier as solutions are available for all of these with capital cost of less than \$100 and opex of under \$40 / month.

3. Distribution Centres (Pickup and Delivery)

It remains current practice in many environments to receive goods in the morning, and dispatch in the afternoon. By working with industry bodies (in particular retailers) change this practice. It reduces their cost, and the supporting roads required.

For example: semi trailer delivering to a distribution centre arrives full, and leaves empty in the morning. In the afternoon an empty semi trailer arrives and leaves full. This practice guarantees those vehicles occupy the road twice as long as they should.

I encourage Governments to work with the retailer associations to drive changes in behavior across the industry.

4. Distribution Centres (Consolidated Delivery)

Current practice has many transport companies delivering to the same Distribution Centre. Whilst an individual transport company can consolidate deliveries within their organization no capacity for this exists across several transport companies without special arrangements.

I encourage Government to work with retailer associations to encourage retailers to enable the consolidation of deliveries into their Distribution Centres.

5. Other (Consolidated Delivery)

Current practice has many transport companies delivering to the same location. Whilst an individual transport company can consolidate deliveries within their organization no capacity for this exists across several transport companies without special arrangements.

I encourage Government to identify alternatives such as freight exchanges to allow increased interchange of freight within the network.

Improvements in global track and track and Proof of Delivery have removed the barrier to using these technologies

6. Industrial Agreements

The current industrial agreement covering transport drivers considers overtime on a daily basis for hours in excess of the prescribed shift. This, coupled with meal allowances, has effect of creating an incentive for drivers to take longer than necessary to complete a given set of tasks.

There is anecdotal and empirical evidence that professional drivers have different driving behavior in the morning and afternoon.

I encourage Government to look at the industrial award structure, and in conjunction with all stakeholder provide a living wage with appropriate compensation for overtime that does not build in this incentive.

7. Identity

Digital identity is used in many parts of interacting with government. But using the same systems in a more broader context is blocked by restrictive terms on the identifiers.

The Australian Customs Service has implemented digital certificate identities which would be useful in many other settings but cannot be.

Similarly ASIC has identifying capability that cannot be reused.

I encourage Government to look at broader use cases of existing identity systems with a view to enabling their use in broader applications.

8. Physical Asset Tracking (Telematics)

The use of vehicle telematics is low in many segments, but increasing, develop incentive programs to enable all commercial vehicles to implement this technology. It has enormous benefits to Fringe Benefits Tax compliance, fuel theft reduction and lone worker safety.

The existing telematics systems rely on expensive 3/4G wireless radio solutions. Tomorrows are based on Internet of Things Long Range radio (LoRaWAN) messaging which has significantly lower cost and power requirements making it available for use in unpowered assets.

The ACMA has currently enabled the 915Mhz spectrum for this technology and is already advanced in their governance of this spectrum. However as more devices are added spectrum congestion will likely occur especially given the class based license utilized.

I recommend the ACMA continue to encourage the low cost use of these networks and to relax their rules to allow loosely coupled not for profit associations to operate nodes on these networks without requiring a carrier license.

Other Questions

9. Traffic Lights

There is no global standard on the "Green" phase of traffic light lantern sequence. Some jurisdictions (UK) have a AMBER+RED short sequence prior to GREEN that is still in Australia but being phased out in favor of a direct from RED to GREEN sequence.

Given that it provides drivers with a notification that the lantern is about to go green why is being changed in Australia?

Conclusion

Firstly, I would like to thank Julian Breheny, and Anthony Swan for their taking the time to understand the issues. Clearly from our initial meetings and subsequent discussion they have adopted a genuine consultation approach.

Whilst I consider all of the above required, the area that I think will have the greatest impact is the making available a digital equivalent of the road network. It is aligned is organization digitization initiatives in other the private sector I am involved in and provides the base level data for solutions to problems we have not even thought of yet.

Regards,

- Darren O'Connor