RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD

FASTTRACK

THE NEWSLETTER OF THE HORIZONS PROGRAM | January 2020

INSIDE THIS ISSUE – WHAT IS SHAPING THE RAIL INDUSTRY TODAY AND INTO THE FUTURE

Connected - Driver Advisory System

Rail networks across the country are investing in High Capacity Signalling systems to meet increased service demand projections. The operational rollout of rail network digital systems takes significant time and one innovative system that can be integrated as part of the digital system rollout is a connected driver advisory system (C-DAS).

A driver advisory system (DAS) is an onboard processor-based system that provides a driver with information to achieve the timetable sustainably, by regulating the speed profile and avoiding unnecessary braking. Standalone DAS (S-DAS) has data downloaded to the train at the start of its journey, but a C-DAS is enhanced with a communications link to provide real-time updates of information to the train, including processed signalling and network train running information along with other information such as temporary speed restrictions.

Train Drivers today are solely responsible for the management of maintaining a train's timetable schedule while operating the train in a safe manner in accordance with a network's signalling system and track infrastructure speed constraints. For a driver to achieve this, a driver must solely rely upon utilising their route knowledge and train management skills to ensure a train is on-time and be able to respond and anticipate future actions based upon signal indications and train performance.

C-DAS calculates and displays to the driver through the driver machine interface (DMI) an energy-efficient speed profile to enable the train to meet the timetable, taking into account timing points, line speeds, including speed restrictions, and the train's characteristics and capabilities. The advisory information supports the driver to achieve the timetable and monitors the train's progress towards the next timing point to identify any changes required to the speed profile. This continual information aids the driver in operating the train consistently in a proficient manner that can avoid the need to brake at adverse signals, therefore reducing the risk of signals passed at danger and also improve operational and energy consumption performance.

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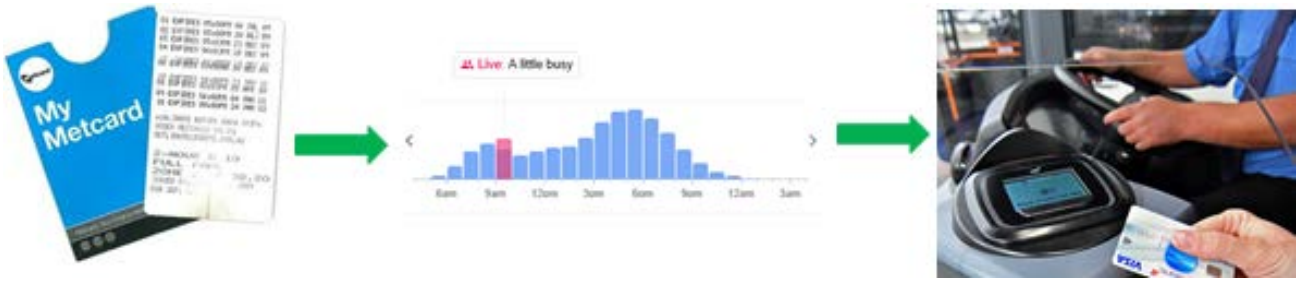
Tickets! … Please?

Think 1994 – It is a wet Melbourne day and with a familiar sight of people clamouring to protect their MetCard paper tickets from the rain to get on a train home. Can you remember days of paper tickets, conductors and even the dreaded MyKi introduction? Maybe not, but for sure we know that our ticket systems move revenue, not people, most efficiently.

Our 19th century ticket systems are location and length of time dependent. A smart 21st century ticketing system uses mobility as a service - reducing crowding, stabilising network performance and optimising fares. Liu and Charles (1) Show that spreading of peak demand through ticketing initiatives achieves a more plausible return than infrastructure investment alone.

Railway operators have put their toes into smarter ticketing systems that encourage people to inform how people use transport services. Wayfinding apps, automated travel alerts and account management did not exist even 10 years ago.

Next steps are underway. Contactless card payments are here, rolled out in cities such as London and Bangkok (2). Location services and demand profiles seeks to better inform passengers about crowding and potentially offer varied pricing depending on conditions.



References

1. Liu Yulin, Phil Charles “Spreading peak demand for urban rail transit through differential fare policy” The University of Queensland 2013
2. Vix Technology : https://vixtechnology.com

An Intermodal Approach to Freight

Australia's trade volume is growing and is expected to keep growing as its population increases. This has resulted in much of our ageing infrastructure reaching capacity at a much earlier time than previously anticipated.

Whilst more ports could be built across Australia, the time, money and effort required often results in some areas getting funding whilst others do not. Often the infrastructure to access the port is also not adequately geared up to send and receive large volumes of freight. In Western Australia, the Department of Transport has set up the Westport Taskforce to study and assess options in managing Western Australia freight demands over the next 50 years.

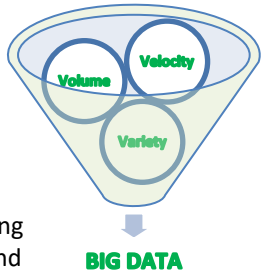
Stakeholders in the Westport Taskforce such as Arc Infrastructure have taken an "efficiency" approach to help reduce pressure of our ports. Rather than having ships come to port and unload on old crowded container terminals and trucked out on ageing roads, a new "intermodal facility" is being setup at Kenwick, some 30km inland. This intermodal facility will essentially be an "inland port" where there is already existing heavy haul routes and easy access to the main heavy transport arteries around Perth.

The Kenwick facility will significantly improve the efficiency of the port, as containers can be quickly evacuated to or from port via rail. Trucks can then be redeployed to the pick-up and delivery task, transporting the containers the "last mile" between the intermodal facility and the customer.

Big Data in Rail

Big data is a buzzword currently been thrown around in many industries. The question is what does it mean and how can the rail industry benefit? Gartner's definition is (circa 2001) Big data is data that contains greater variety arriving in increasing volumes and with ever-higher velocity or the 3 V's.

1. Volume - the amount data
2. Velocity - rate at which data is received
3. Variety - type of data



Why capture data?
Big data has the potential to transform the whole life cycle of rail networks from conception through to operation and maintenance of assets by capturing data and analysing it to improve quality of services, gain cost/time savings and enhance efficiency just to name a few applications.

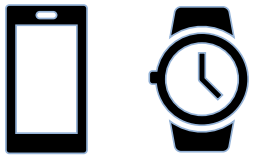
Operations and maintenance applications include:

- Failure detection
- Make diagnoses
- Trigger maintenance actions

So where is the rail industry at and how is data being collected?
Well, the rail industry is currently collecting data from all kinds of sources in the rail network, from ticketing machines at stations to super sites capturing rolling stock data for maintenance purposes. The potential to capture data is endless and plenty of data which is being missed. What sensors can be installed in future infrastructure or retro fitted to make services better?

As our world is becoming more digitalised there is also greater potential to capture data from people's personal devices such as:

- Mobile phones
- Smart watches
- Wearable technology



The data provided by these devices could potentially provide information about passenger comfort and mood by tracking heart rate, perspiration and facial recognition. With all this potential to gather information, can we make rail services better by inputting all this data into a model such as a digital twin?

The question is not can we gather the data, but how do we gather it without invading people's privacy? And, how do we best use big data to provide the best services possible in the rail sector?

Managing Complexity

With the evolution of technology, modern railways are becoming more and more complex. Systems are now typically software-intensive with a heavy reliance on telecommunications, and have socio-technical interactions, multiple operational and technical stakeholders, and numerous interfaces. Due to this, implementing or upgrading these systems to meet increasing passenger demand presents significant challenges, all within a dynamic project environment.

But what if there was a way to:

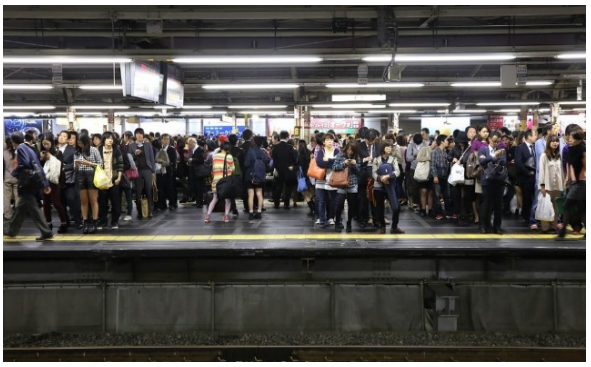
- Create a common understanding of the socio-technical behaviour between multi-disciplinary teams
- Improve the understanding of software-intensive systems functionality and interfaces
- Ensure earlier and better stakeholder involvement and communication, allowing change impact identification and tailored artefacts
- Provide rationale for and support decision-making processes
- Increase related project awareness and analysis
- Provide better structuring, rigor and traceability of interfaces and requirements identification and management.

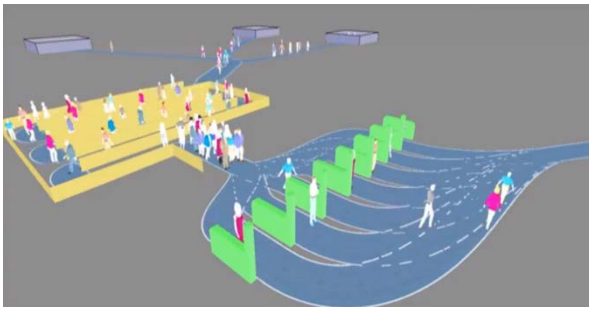
Well, there is a way; using Systems Engineering.

Systems Engineering manages complexity and risks in a rigorous and structured manner throughout the project and system realisation lifecycle. It is an interdisciplinary approach that enables the realisation of successful systems (INCOSE 2015). Based on systems thinking, it focusses on understanding the system as a whole and the interrelationships of the systems elements to the whole (INCOSE 2015). By applying proven Systems Engineering methodologies, you can achieve a holistic understanding of the solution system in your railway, reducing project risk and cost of re-work.

Check out the International Council on Systems Engineering for more information or refer to *ISO/IEC/IEEE 15288:2015 Systems and software engineering – System life cycle processes*.

Station Ergonomics and Mobility Simulations





As the rail industry continues to develop and passenger numbers rise, there becomes a greater issue around passenger congestion. The United Nations estimates that there will be an extra 2.5 billion more people living in the world's cities and urban centres by 2050. If the United Nations estimates are correct, the potential for congestion and gridlock will be at an all-time high.

Right now, our challenge is to design and build infrastructure that promotes both safety and mobility during this period of rapid population growth. Ensuring that large numbers of travellers can move freely and efficiently to, through and from a station is essential to

maintaining the operational effectiveness of the transport system as a whole.

There is one innovation gaining popularity in this field called Mobility simulations. Mobility simulations enable the creation of real-world movement simulations while reducing the time necessary to carry out these complex tests. These simulations help governments and partners better understand commuter flows, person-hours travelled, economic and environmental benefits of urban mobility improvements, and even help with the calculation of multi-modal levels of service.

By creating various scenarios, you can try creative solutions to some of the toughest mobility challenges, for the improved design and of the stations of tomorrow.

Thanks for reading

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