



Hello!

Welcome to the Spring 2017 edition of the INCOSE Transportation Working Group newsletter. We have decided to move to bi-annual newsletters: one shortly following the summer Symposium and one shortly following the winter Workshop.

This edition includes updates to the TWG Steering Committee org chart as we welcome some new faces to the team, along with some career change news for some of our members. It also includes a case study of SE in transportation from the TWG's growing library of case studies, industry and event news, news on our attempts to keep the TWG website and mailing list updated, and an overview of future events.

INCOSE just hosted its 2017 International Workshop and the TWG was again well-represented and hosted its own successful sessions. This event has set the TWG up nicely for the forthcoming International Symposium to be held later this year in Adelaide, Australia! Check out page 2 for more information on IW17 and IS17.

The TWG continues to grow, and we are constantly seeking to grow our footprint and network of members. Please forward this newsletter to those you think may be interested, and please do continue to support the TWG by attending (or giving!) our webinars, joining (or starting!) the conversations on our LinkedIn site, and of course, start making your plans for Adelaide...

With warm wishes for 2017,

Dale, Nita and Simon



Flickr, Public Domain

Member in Focus:

Melissa Jovic

Transport New South Wales

By: David Rojas, SFMTA



1. What is your role at 'Transport NSW'?

I work in Freight, Strategy & Planning Division; Transport Network Branch; Strategic Rail Transport Group. I'm leading the Corridor Development Team as Principal Manager. Our team is performing the technical advisory role for long-term rail programs and projects (from 2025 to 2063). Long term development starts from strategy following strategic merit test and finishes with the Strategic Business Case. My team is providing assessments and advice regarding rail infrastructure as well as system engineering for all transport modes (heavy rail, metro, light rail, buses, roads, ferries, etc.).

2. In what sectors of the transportation industry have you worked?

I'm a chartered professional civil engineer with more than 30 years of experience in strategic planning, design, and program/

project management of railway and infrastructure projects. I'm also a Fellow of Engineers Australia. My experience includes high-speed, heavy and light rail systems on a wide range of projects within Australia, New Zealand, and Europe. Since 2009 I have been working for NSW government in the area of rail transport strategy. This encompasses development, refinement, and implementation of strategy, business cases development and governance. Also, my work includes the application of System Engineering in order to ensure benefits realisation and justify integrity and operational consistency within rail strategy portfolio.

3. Was there an event that awakened 'Transport for NSW' to the SE approach or was it a gradual development?

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TWG at IW17 Review and Report

By: Dale Brown,
WSP Parsons-Brinckerhoff

Transportation & Infrastructure WGs – Collaborative Sessions

TWG members attended sessions of the Critical Infrastructure WG and Infrastructure WG on multiple topics related to critical infrastructure protection and other common issues related to infrastructure and transportation projects. The sessions identified some collaborative efforts for 2017, including possibly writing joint papers, sharing webinars and other general knowledge sharing opportunities. Of particular note was the advent of several discussions (over the course of the IW) related to the possible merging of these working groups. This concept explored potential efficiencies that could be achieved because of the significant overlap between these related working groups. There are scarce volunteer resources and a comment mentioned by attendees for the past several workshops has been that “there are too many working groups and too few volunteers”. Stay tuned for further discussions and developments on this concept.

“Filling the Systems Engineering Talent Pipeline” - Cross-Cutting INCOSE Workshop Event

The intent of this workshop was to find ways of improving interest in Systems Engineering for young professionals. This session was facilitated by the TWG and was held as an open brainstorming session to address this serious issue for all INCOSE Working Groups and IW attendees.

A survey was created and issued prior to the IW and was held open for all of the IW

in an effort to collect some data for evaluation by attendees.

An important initial conclusion from the survey was: “this is an actual problem that needs to be addressed” and is likely related (in the US) to a national drop-off of engineering students interested in infrastructure and transportation as was cited at the NASEM/TRB annual meeting in January (National Academies of Science, Engineering and Medicine – Transportation Research Board). In addition to the survey results, analysis of the session attendee inputs from the brainstorming event will be issued to all TWG members and IW session contributing attendees in a report prior to the IS 2017 event. It is expected that a panel session will continue this work at IS 2017.

TWG Working Session

The TWG held a working session to discuss our progress in 2016, and review and agree our Annual Plan for 2017.

TWG Hackathon

The TWG continues to keep its website, mailing list and LinkedIn pages up to date and we have kicked off a project this year to refresh update our mailing list. We were unable to refresh our public-facing INCOSE website, due to access issues – a work ticket was raised to repair the TWG page access issue.

TWG at IS17

The INCOSE International Symposium is Jul 17, 2017 - Jul 20, 2017 in Adelaide, Australia. TWG will be there and our panel discussion on Improving Interest in Systems Engineering for Young Professionals has been accepted! This discussion will continue on from the initial session at IW mentioned above. In addition to the panel, there are other transportation-related papers that have been accepted by INCOSE from our membership and more information on this will be appearing in our IS2017 Flyer - stay tuned!

SE Case Study #4: Docklands Light Railway Expansion

By: Bruce Elliott

Background to the Project

The Docklands Light Railway (DLR) is a driverless light transit railway which covers regenerated parts of East London that are not well served by the Tube. The DLR now runs trains over a significant network but, in 1992, it was a small operation running 11 vehicles over two short routes.

In 1992 the railway's owner, the London Docklands Development Corporation, let a contract for a significant upgrade to build a new extension, increase the vehicle fleet to 70 and replace the train control system. A fixed-price contract was awarded to a joint venture formed by Booz Allen Hamilton and Brown & Root to perform the roles of prime contractor and systems integrator, and to deliver the upgrade. This contract included requirements for the performance of the completed railway and payments contingent on meeting these requirements. The new trains were supplied by Bombardier and the train control system was supplied by Alcatel, both under contract to the joint venture. The contract was completed in 1996.

This case study is drawn from an interview carried out in March 2011 with a senior member of the project team.

Description of the Challenges Faced

By the time that the project was complete, only a small fraction of the railway was as it had been before and many of the changes were of a fundamental na-

ture. Not only had the train control system been replaced but a two-route railway now had multiple-routes, switched at several complex junctions.

The consortium inherited several existing contracts for the vehicles, train control system and an extension, which had not benefited from the adoption of a full SE approach.

There was significant innovation involved. The train control system had never been used on complex junctions before and required enhancement to its logic to cope. Moreover the train control system, which must control the position of trains very accurately not only for safe train separation, but also in order to ensure that trains are adjacent to a platform when the doors open, had only previously been used with trains powered by linear motors; it now had to control new trains powered by more traditional, rotary motors, introducing slip/slide issues.

All this had to be accomplished in a regulated, safety-critical industry with only short interruptions to the operation of the railway and under a contract that transferred a significant amount of risk to the prime contractor/systems integrator.

Description of the SE Performed

It was apparent to the prime contractor/systems integrator from the outset that the project could not be delivered successfully without an SE approach.

Systems requirements were articulated and, from them, requirements were derived for the vehicles, the train control system and the interface between them. An operational simulator, using Monte Carlo algorithms, and models of reliability, availability, maintainability and performance, were built in order to check whether the design would deliver the contractual requirements and, where there

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Career Change Corner

By: David Rojas, SFMTA

This new feature is an opportunity to learn about career advancement experiences of practicing systems engineers. Contact a steering committee member if you want to share your story.

Simon Smith, IBI Group to AMCL

What were your responsibilities in your former position?

IBI Group is a global architecture, engineering, planning and technology firm focused on improving the urban environment. I worked with IBI for over 8 years, and in that time helped establish and grow their Systems Engineering practice. My role involved the provision of SE services to IBI's clients across transit and highway systems, and typically included strategic system and program planning, ConOps development, requirement engineering and system architecture development.

What are your responsibilities in your new position?

AMCL is the world's leading specialist Asset Management consultancy with offices in London, New York, Sydney and Hong Kong. Our services include assessing and benchmarking organizations' asset management (AM) maturity against internationally-recognized standards such as ISO 55000, developing roadmaps for improving organizations' AM maturity and providing advice and support to organizations as they implement the roadmap. AMCL is also a world-leading AM trainer, and our clients often ask for an AMCL training program to accompany an assessment. I have joined AMCL at an exciting time, as it seeks to grow its footprint

in the United States. My work includes the provision of consulting services to our clients and business development activities in support of this goal.

What new challenges do you anticipate in your new position?

Although I did some Asset Management work with IBI, my main focus was on Systems Engineering in the transportation sector. With AMCL my focus will be on Asset Management in the transportation, power and utilities sectors. I see my main challenges to be increasing my formal knowledge of Asset Management and also learning about new sectors - however these challenges, as well as the opportunity to work with world experts in the field, are the main reason I decided to take up this new position!

What skills and experiences from previous employers are going to be most valuable in your new position?

Asset Management and Systems Engineering are closely related fields: both share systems and lifecycle thinking as a common foundation, along with recognizing the importance of 'line of sight' from top-level objectives to the people, processes and systems being implemented

on the ground. Asset Management also places emphasis on several technical disciplines with SE, such as requirements engineering, reliability analysis and configuration management.

Jen Russell, WSP Parsons Brinckerhoff to Garver

My recent change from being a Lead Systems Engineer at WSP|Parsons Brinckerhoff to being a Senior Project Manager at Garver has been a fun transition. While at WSP|PB, I was a systems engineer on the California High-Speed Rail project. WSP|PB was the program manager for the HSR program, and I supported the verification of the system. That was a great experience and I miss my PB colleagues.

Now with Garver, I have a host of new opportunities! I'm working to develop quality control processes for a highway department, planning and alternatives analysis for a regional airport, and developing internal corporate procedures for project management. I'm thrilled with the wide range of opportunities I've already had at Garver and there seem to be few limitations to what's possible! I feel like I'll be supported in any challenge I endeavor.

Highway SE News

By: Alan Benson, Caltrans

State of California Department of Transportation (Caltrans) has struggled for many years getting the 12 Transportation Management Centers (TMC) to agree on common operations of managing transportation. To get a set of statewide common operations has challenged the development of Intelligent Transportation Systems (ITS) applications. Each TMC believes their operations is unique to their region's transportation challenges therefore, each TMC wants its own ITS application, creating multiple Advanced Transportation Management Systems (ATMS). The support of these ITS applications has also evolved in different procedures across TMC's.

The goal of Caltrans is to unify the operations and support statewide. The initial steps in accomplishing this goal is to create a Concept of Operations (ConOps) for each TMCs, identifying the current (As-Is) operations and support, establishing a set of Standard Operating Procedures (SOPs). Caltrans, working closely with its Systems Engineering (SE) Team, is currently completing the initial phase of this project by visiting each TMC, conducting interviews with both TMC operations and support, documenting the As-Is of the TMC.

From the 12 TMC As-Is operations, derive a set of SOP's, as a single statewide To-Be ConOps. From the single statewide ConOps, identify the functional requirements for a single statewide ATMS. Using the functional requirements, the SE Team with Caltrans performs a trade study on candidate ATMS's; Identifying the gaps in functionality for future enhancements and interfaces for integration.

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A View from the Field

By: Dale Brown,
WSP Parsons-Brinckerhoff

Aside from INCOSE, three notable organizations are worth investigating in the spirit of understanding the wider spectrum of transportation stakeholders around the globe.

APTA Systems Engineering Subcommittee (R&T Committee):

The SE subcommittee at APTA is pursuing three North American (NA) initiatives: (1) Assessing the state of SE practice in NA Transit (2) Creation of an NA agency roadmap for implementing SE (3) Providing advocacy and outreach to senior NA transit agency management. The SE subcommittee will next meet to discuss progress on these initiatives at the APTA Rail Conference, held on June 11-14, 2017, at the Hilton Baltimore, Baltimore MD. The Chair is David M. Springstead (MARTA).

UITP (International Union of Public Transport)

UITP (Union International des Transports Public or International Union of Public Transport), opened a North American office in New York City in 2015 as part of an effort to bring North American transit agencies into a global network of agencies dating back to 1893. MTA hosted a successful first UITP International Rail Forum in NY last December. This was a well-organized series of meetings and panel discussions. The sessions were efficiently packed into 2 days. There were some excellent open exchanges of experience and information from rail property owners around the world on topics ranging from Security and Resiliency to Advanced Train Control. UITP will hold its 2017 Global Public Transport Summit on May 15-17 in Montréal, Canada.

Transportation Research Board (TRB)

The Transportation Research Board (TRB) is one of the 7 major programs of the US National Academies of Sciences, Engineering and Medicine (NSAEM). This is a massive event and there were around 860 sessions running this year with 6,000+ papers reviewed and multiple locations around Washington drawing more than 14,000 attendees from all over the world. For this reason, it is highly recommended that first time attendees attend the recommended orientation presentations on the first day. The TRB runs an extensive series of webinars each month and two notable conferences next on the 2017 agenda are: 2017 Joint Rail Conference on April 4-7, 2017 in Philadelphia, PA and International Congress on Transport Infrastructure and Systems on April 10-12, 2017 in Rome, Italy.

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For many years, the TMCs have had complete autonomy in the direction on operations and support for the ITS applications. Accomplishing the goal of unifying the operations and support, yet maintaining TMC autonomy, has shown to be as challenging as herding cats.



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We have relatively short history of SE application in NSW Rail entities. In the early 2000s, the SE approach started in Rail-Corp; firstly as BRS and SRS structured in DOORS. We learnt that Governance and Sponsor's role needs to be defined and that Sponsor needs to be given full control and oversight of funds from the beginning (Strategic Business Case) to the end (Commissioning and benefit realisation). For example: capital funds contingency couldn't be unlocked without deliverer's justification and sponsor's agreement. In the land of million Stakeholders, it was compulsory that inputs were assessed and stakeholders hierarchy established as three tiers (primary, secondary and tertiary) with RACI (responsible, accountable, consult, informed).

In parallel, we have established Requirements Library and Requirements (embryonic) standards was published in the form of BRS & SRS Standards.

From NSW previous rail organisations – SE lessons learned are: (1) DOORS – or any other database software compulsory to manage requirements change over long time and constant personnel change (2) Governance and Sponsor's role defined – compulsory (3) Stakeholders hierarchy – compulsory (4) System architecture - requirements library (5) System Engineering Standards

4. How does an SE approach contrast with traditional transportation planning?

Our organisation Transport for NSW is relatively young, established in 2011 and our primary business is service delivery. Our focus has completely changed and shifted to interfaces and collaboration. For example: Our customer is centre of everything! All transport modes are fully

synchronised with seamless service delivery (not particular assets or timetable or policy). All modes strategy and planning are based in same division, while all modes development is happening in the other division. For all modes delivery - delivery offices are in charge.

Course corrections that made a difference: (1) NSW Government structural change - establishment of the Transport for NSW (2) Policy recognition of mode interfaces (3) Driving "cultural" change (4) System Engineering acceptance as "necessary tool" to guide investment (5) System Engineering standards, plans, guides etc

5. Have there been any tangible benefits compared to traditional planning efforts?

SE brings together land use and transport planning, helps to identify existing or new transport corridors that link the places between and which people want to travel. SE tools are helping such that all inputs are considered from the level of demand along each corridor as well as the capacity of the corridor, the capacity of a transport mode vehicle and capacity of the interchange places to meet current and future demand. SE is our platform for trade-offs assessment in order to define the performance required from the transport network or to articulate the type of transport service and network response required to meet customer needs on that corridor. Most importantly SE assures connected and integrated system

The need for new transport infrastructure depends on how well existing infrastructure is maintained and used. There is a strong inter-generational equity argument for financing transport infrastructure using public borrowing. Today's travellers

benefit from past investments in the transport network: Net Present Value (NPV): gives an indication of the magnitude of the net benefit of the initiative to society. Projects are appraised positively if the net present value of the project impacts is greater than zero. Benefit-Cost Ratio (BCR): is a measure of the value for money of a project. A BCR greater than one indicates that a project will provide net benefits to the community.

6. What level of traceability do you desire to achieve?

Our target is that System Architecture becomes one of primary investment assurances. In particular this links and interfaces for the life of the investment between: (1) all specifications and documents (BRS, OCD, MCD, SRS) (2) All plans (SEMP, RMP, SCMP, CMP, A&GP) (3) Monitoring, validation and verification (4) The investment impacts.

7. What sort of tools do you use every day?

(1) SE Documents - Process to assure cohesion delivery from end to end (2) SEM - System Engineering Management Plan (3) RMP - Requirements Management Plan (4) SCMP - Safety Change Management Plan (4) CMP - Configuration Management Plan (5) A&GP - Assurance & Governance Plan

8. How is the SE effort managed/mainained within your organization?

"Our key driver for systems engineering results from a combination of the complexity of our transport system and our environmental systems. We have a multitude of competing inputs and mass of stakeholders with many opinions. So, it is our imperative to manage and maintain the SE efforts as best as possible. TfNSW

has clearly defined policies and standards regarding investment gateways. For example TfNSW Investment Gating & Assurance Guidelines and TfNSW Asset Management Framework. We are aware that so many issues need to be managed and so many questions answered as:

(1) 15% scope vs. 85% investment commitment - How are we tailoring SE in Strategic Business Case development with so many unknowns? (2) Traceability & Cohesion - What would be appropriate mechanisms? (3) Clear economic rationale -How to accommodate the need for particular service delivery and infrastructure plan? (4) Investment Sustainability -Services and infrastructure can only be delivered, improved and maintained through sustained, targeted and planned investment. (5) Future Proofing - How to develop and plan investment to be sufficient for the long-term needs?

Thanks to Melissa for taking the time to talk to us! Thanks Melissa!

(continued from Elliott, pg. 2) was a shortfall, to prioritize cost-effective changes to remedy it. The operations and maintenance requirements were translated into system requirements which allowed co-ordination between development of the technical system and the development of the operations and maintenance procedures.

A comprehensive series of integration tests was specified and performed at the manufacturers' facilities and on the delivered railway itself, with additional testing defined as part of the requirements management process.

All of this was thoroughly documented, with traceability between the documents, and was maintained under configuration control.

Administrative Update

By: Allison Ruggiero,
MTA New York City Transit

Have you 'Liked'  the Transportation Working Group website and LinkedIn content over the past 6 months?

The TWG has been continuing to deliver some interesting presentations, discussions and case studies. All of which you can keep up to date with on the [TWG Website](#) or if you missed it catch-up via our [TWG youtube Channel](#). Whether you're looking for information on the upcoming International Workshop 2017 in California, keen to listen-in to a range of webinar topics or simply referencing our case studies library, our website is a great resource to meet your needs.

The TWG would love to have your input and hear your views. We are endeavoring to keep our membership expanding and up to date with all the latest information and events. To this end please keep a look out for future emails and announcements regarding your continued desire to be on the mailing list.

"I love to talk about nothing. It's the only thing I know anything about." (Oscar Wilde). I'm sure we can improve on that, so please connect with the TWG on [LinkedIn](#). This is a beneficial forum to interact with other individuals passionate about applying Systems Engineering practices, post discussions, share interesting articles, and even announce job openings within your agencies to interested members. We're quickly approaching 1000 members, so have your voice heard amongst a wide range of Systems Thinkers!



Flickr, Public Domain

Call for Webinar Champions

By: Hamad El Gibreen, Keio University

Calling all presenters! The TWG is seeking speakers for its ongoing webinar series on SE in transportation. In the INCOSE Transportation Working Group we do our best to benefit transportation practitioners and academics in providing them with an opportunity to think about and address their professional endeavors in a systematic manner while staying on top of socio-technical complexity challenges. That said, the TWG is completely dependent on the works and efforts of its volunteering community with their diverse backgrounds and expertise, providing multi-viewpoints and added value to our

audience. Therefore, we are very happy to host whoever is interested to give back and positively influence fellow practitioners and academics by sharing best practices, success stories, knowledge and experiences that could help everyone in adopting a systemic thinking and approach. We also welcome those rebels who want to scratch our brains and challenge the status-quo by proposing novel and innovative ideas.

So, let us benefit the community together and collaborate to have the best webinars in 2017 that help us tackle our future together!

If you are interested in conducting a webinar anytime during 2017 kindly contact Hamad El Gibreen at hamad@keio.jp and we will be more than happy to host you.

Join LinkedIn!

By: Jean Souza, Stellar Solutions

My family met several times this fall with our global student, Jorge, who is from Spain. He was on a one semester visiting scholar program at UC Berkeley and wanted to share experiences with an American family. To keep in touch, Jorge gave me his personal email address and an invitation to LinkedIn. LinkedIn is the social media career networking site and is the best way I know of to keep track of school classmates and former colleagues through all the changes life brings. LinkedIn makes networking simple. It is also a TWG resource.

There are over 700 LinkedIn INCOSE TWG Group members. The Steering Committee posts TWG events such as webinar announcements, IW workshops and IS call for papers. To join the LinkedIn INCOSE TWG Group, just type in the name in the LinkedIn search window and click on Join. As a member of the TWG LinkedIn Group you can share a link or an article, ask for input on a topic or article or share a job opening that is relevant to the interests and intent of the TWG. And you can respond to posts by other members.

Leverage the 700 plus LinkedIn INCOSE Transportation Working Group members the next time you want another perspective on a challenge you are facing. Share that transportation article that made you nod your head. And join us for the next webinar. Your participation will enable the TWG to stay relevant and informative.

New Faces on the Steering Committee

By: Simon Smith, AMCL

We have three new faces on the steering committee since our last newsletter: Wilson Fung of Network Rail in the UK has joined in the role of Member Services (EU) and Hamad Elgibreen of the Keio University in Japan, has joined in the role of Member Services (Asia Pacific). We also welcome Hoki Tse, of the City of San Jose, California, to the new role of Government Liaison. We welcome back after an 18-month absence Andrew Mark, of Systra Scott Lister in the UK, in the role of TWG Administration. Please join us in welcoming Wilson, Hamad, Hoki and Andrew to the Steering Committee. We're looking for volunteers to support TWG Outreach in Europe and Asia Pacific! If you, or someone you know, would like the join the TWG Steering Committee and make a real difference to the growth of the TWG and SE within Transportation get in touch with Simon, Dale or Nita.

Wilson Fung is a Senior Modelling Engineer at Network Rail. He has a Bachelor of Engineering degree specialised in Operation Research. During the course of his study, he has acquired a detailed understanding of the analysis methods. He joined Network Rail in 2007. Since then he has been engaged in railway system performance and reliability analyses for a number of enhancement schemes: West Coast Route Modernisation, Crossrail, Waterloo station redevelopment and Cardiff Area Signalling Renewal. Wilson is currently engaged in High Speed Two leading engineering analysis, modelling system wide capability, performance assessments of technical/operational designs as well as trade-off studies and supporting on the development of railway

systems integration and the development of RAM targets.

Hamad El Gibreen, PMP, is currently a master's candidate in the Graduate School of Systems Design and Management, Keio University, Japan. With an educational background in electrical engineering and a modest professional background between telecom and railway sectors, ranging from mega project management to infrastructure networks planning, traffic timetabling and performance management, Hamad felt the

need to have a completely different approach to how we need to tackle current and upcoming complex challenges, especially going into a highly exponential and disrupting future. Therefore, he is currently on a path to learn and practice systems engineering, design thinking and innovation through his studies as well as projects. He is also trying to positively impact the transportation community generally and railways specifically by holistically conceptualizing and designing railway sectors as collaborative and innovative enterprise systems, through active

cooperation with a Saudi railways sector - a sector under huge transformation demands.

Steering committee members Rhianne and Konstantinous have both moved on to new endeavors and we would like to thank them for their contributions over the past few years. Good luck!

Steering Committee

