Parramatta Light Rail: Embedding Systems Engineering Into the Development Lifecycle

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Outline

• A bit of context
• What is the project?
• Systems Engineering in TfNSW
• Systems Engineering on PLR
• Other
  – Urban Design and SE
  – Digital Engineering and SE
A bit of context
Greater Parramatta and Olympic Peninsula
What is the project?
Goal: To deliver integrated light rail services that support the government’s vision for the Greater Parramatta to Olympic Peninsula Priority Growth Region

<table>
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<tr>
<th>Category</th>
<th>Project Objective</th>
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| City Shaping   | • **Support the vision for Parramatta as a 21st century city** – attracting new investment and economic development  
• **A catalyst for shaping new growth** - activating underutilised lands and providing the transport capacity needed to support sustainable population and employment growth in the area |
| Connectivity   | • **Connecting people and places** – supporting the diverse mix of customer journeys that links employment, cultural, educational, health and sporting precincts with existing and new communities |
| Place          | • **Contribute to the creation of local hubs** – supporting the creation of attractive and memorable public spaces that are better utilised by communities |
| Choice         | • **Providing attractive transport choices for customers** – ‘turn up and go’, safe, reliable, all day light rail service that is integrated with roads, buses, trains and active transport |
Recommended to consider

Difficulties to be mindful of / Opportunities

Benefit from our mistakes
Systems Engineering in TfNSW

- TfNSW employs an Authorised Engineering Organisation (AEO) model.
  - Organisation are authorised by assessment of their management systems and the deployment of those management systems.
  - Client organisation needs to define the scope for the AEO in a contractual arrangement.
  - Systems Engineering is a key engineering competency in obtaining AEO status and is one of the pillars of the AEO’s assurance argument.

TfNSW Asset Standard Authority have created a systems engineering ecosystem that significantly reduces the barriers to implementation.
Asset Lifecycle
Systems Engineering on PLR

- PLR is a complex and safety significant project
- We are therefore employing the full suite of systems engineering activities

- Requirements Management
- Interface Management
- Verification and Validation
- Systems Architecture
- RAMS
- EMC
- Human Factors Integration
Technical Advisors on PLR

- Infrastructure Technical Advisor has set up the SE framework as the lead.
- Other Technical Advisors are working within the framework to produce their deliverables which will be integrated by the Infrastructure Technical Advisor.
- This is also being adopted for safety assurance, sustainability in design, digital engineering etc.

Having a lead on systems engineering who is passionate and can “sell” the benefits of systems engineering with support from the client.

Schedule the advisor inputs such that they can be contracted into a coherent program.
Requirements Management

- DOORS being utilised
- Integrated with change management process and stakeholder requirements capture.
Business Requirements Specification

- Based on the ASA requirements schema
- Requirements traced from the previous business case, draft OCD, customer and product strategy or benefits realisation strategy.
- BRS contributors were identified and ratified through the governance group
- BRS contributors from multiple internal stakeholders with differing perspectives

How do you **obtain value for money** requirements?
- Education of BRS contributors for what level of input was required
- BRS to ensure that the “transport product” is considered
Requirements Management

• **Systems Requirements Specification**
  – Currently in draft
  – Aim to capture 100% of external stakeholder requirements in SRS – building discipline around capturing requirements.
  – Traceability will be recorded to BRS, safety assessments and stakeholder needs.

  Taking **Subject Matter Experts** along for the ride.

• **Verification and Validation**
  – Requirement Verification and Traceability Matrix required in the definition design phase against the BRS and SRS.
  – Validation / verification methods included in requirements.
System Architecture

• During the Definition Design we are producing a:
  – Physical System Breakdown Structure
  – Functional / Logical Breakdown Structure
  – System Boundary Definition

• Ideally a systems architecture for light rail will be developed for use on later projects

Portion of a use case.
Interface Management and Integration

• Interface Management
  – Process incorporated into Design Management Plan
  – Identifying internal and external interfaces in design interface register
  – Output interface requirements into System Requirements Specification
• RAMS
  – RAMMP
  – Output of the definition phase RAM requirements apportionment
• EMC
  – Initial EMC review
  – Identification of high level receivers completed
  – Sensitive receivers in hospital and university precincts
Human Factors Integration
Urban Design and SE
FINISHED PROJECT
Digital Engineering and SE

- 3D 'BIM' Model
- 4D BIM
- 5D BIM
- 6D BIM
- Asset Data
- Other Data
- 2D/3D GIS
- Requirements Mgmt
- Document Mgmt
- Risk Mgmt
Questions?