Digital Engineering for Local Government Infrastructure Planning and Management

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1 Introduction

In context of Asset Management, much of digital engineering / building information management emphasis has been on definition, use and handover of asset and project centric information including models, spatial and non-spatial data / information generated through planning, design and construction phases for use and maintain during life cycle of asset.

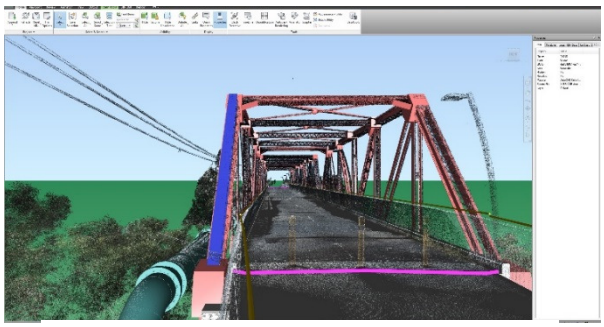
For existing Local Government Infrastructure assets, there is limited established context and case studies for asset management activities around data, systems, technology, processes of Digital Engineering (DE). As our long life infrastructure 'as intended and built for' goes through number of renewal and maintenance cycles, LG asset managers will have to equip with elements of Digital Engineering across whole of life cycle across existing asset portfolio.

The paper covers lessons learned from case studies and pilot of DE tools explored for existing roads and stormwater projects at Logan City Council.

2 Methods and case studies

Logan City Council Road Asset Program implemented a number of digital engineering workflows and tools for managing existing assets. Specific case studies and pilots include a bridge renewal, major culverts and underground arch structure assessment and use of digital road view environment.

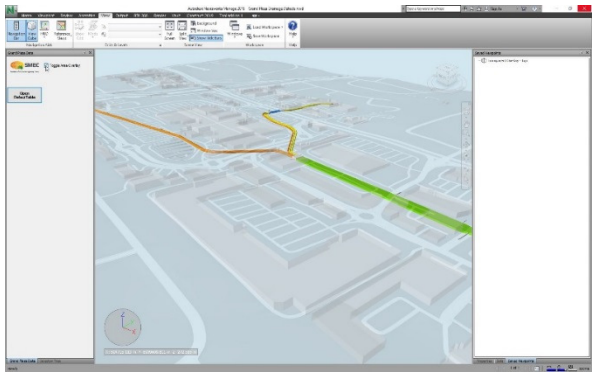
Red Bridge is an iconic steel structure that had to be both structurally repaired and repainted as the coating effectiveness was fading. When the opportunity arose to plan a refurbishment of Logan's historic Red Bridge in 2017, Council's project team decided to adopt some BIM practices during 'Asset in Operations' phase in a pilot project.



A screen capture of the BIM of the Red Bridge

The pilot involved creating an interactive 3D asset information model of the existing bridge based on a drone survey, scanning, as constructed drawings, inspection records and asset renewals requirements.

Another pilot project was for assessments and life cycle management strategies group of interconnected underground major culverts assessments in a business district. These were critical assets to understand the whole of life cycle management given its location and vicinity to buildings.



A survey and laser scanning of the culverts to provide accurate location information for the culverts was organised. From this information, 3D BIM models of the

culverts was developed to include assigning condition rating for monitoring and critical issues to be scoped and costed for a works program package.

Another digital engineering initiative is the recent adoption of a crowd source enabled digital video cloud platform Mapillary with advance algorithms of computer vision and artificial intelligence and machine learning allowing appropriate mapping and object detections for sign, markings and other defects for asset management, scoping and work programming. Using the tools, a review of pavement defects from network survey and input into pavement renewal scoping briefs is underway this year.

3 Findings

For delivery of the Red Bridge project, BIM model assisted to identify the best way to manage the upgrade considering constraints such as the difficulty of using scaffolding over water, the proximity to overhead powerlines, a trunk water main attached to the bridge and potential project impacts on the environment.

The key challenge for underground culverts project include the correct Z location of defects (in a polygon or area context) within the culvert segment without reassociating with image of the defects for future review and monitoring. Future condition assessments using computer vision artificial intelligent tools may be able to provide accurate positioning in a underground 3D mapping.

This projects allowed the team to test the way BIM integrates with other digital engineering tools used by Council such as ESRI, Navisworks and 3D model viewing software. BIM outputs on the renewal and assessment projects will continue throughout the operational life of the bridge and culverts.

The Mapillary platform allows ongoing updates of data and automatic feature extraction in a system that is readily accessible by organisational users and provides many other benefits beyond road asset management. In reality, the users are generating updated asset data without being asset management technicians.

4 Conclusions

These pilots have demonstrated use of DE to manage existing bridge, major culverts and similar structures and long term input / data set to monitor and use. The vital lessons learned on data and system interoperability have been shared for broader industry benefits.

The value for money justification, cultural and skill/ capability barrier, development of tools and processes for broader DE adoption for a new way of doing infrastructure planning, development and management in LG context is herewith us as industry.

An end to end digital engineering framework, tools, platforms and guidelines for local government transport and stormwater infrastructure would prepare us for the next generation asset life cycle management opportunities including autonomous vehicles, stormwater harvesting and recycling.

5 References

ISO 19650-1:2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling

ISO 19650-2:2018, Organization of information about construction works — Information management using building information modelling — Part 2: Delivery phase of assets

PAS1192:3: 2014 Specification for information management for the operational phase of assets using building information modelling