Stop, Collaborate and Listen - How Digital Engineering will change the way we design and deliver projects —

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What is Digital Engineering?

- Buzz Word. We have been engineering digitally for years.
- Not simply using Revit.
- Process used to communicate between teams to design, deliver and manage projects.
- Technology is an enabler for good Digital Engineering processes.
- BIM (Building Information Modelling) is a Digital Engineering process.
Brief History —

- We have been engineering since we have been on earth.
- Refining the way we analyse, design, construct and manage.

Example of what an early structure may have resembled
Brief History—

The Egyptians designed the pyramids.
Brief History—

The Romans revolutionised Bridge construction with arches.
Brief History—
Now—

With technology, we have the ability to design and construct complex structures.
Now: Build digitally—

- Allows design iterations to select the most optimised construction methodology for the project.
- Allows us to plan how we will build it.
- To make sure it all fits.
Now: Build digitally—

- Reducing the amount of RFI’s and down time on site.
- Allowing easier quantification of bridge elements for procurement.
The future: Generative Design—

- Generative Designed Airbus partition, between passenger seating and the galley.
- The image on the right may look random, but is has been optimised to be strong and light with the least amount of material.
- 45% reduction in weight between the existing partition and the proposed.
The future: Generative Design—

- Simple geometric constraints of a box girder ran through a generative design engine.
Safety in Construction—

- DAQRI Smart Glasses and Smart Helmet (hardhat)
3D Printing—

MX3D Smart Bridge, seriously cool technology.
https://mx3d.com-smart-bridge/
3D Printing—

- Smart Bridge – able to track performance data once constructed through a series of sensors.
- Performance data gets analysed in the ‘Digital Twin’ for future maintenance.

The ‘Digital Twin’ model
3D Printing—

A combination of generative design and 3D printing technologies.
3D Printing — 
What hasn’t changed? Our drawings...
Building Information Modelling—

- How do we aim to achieve this Lego ideology?
What is BIM—

Building Information Modelling (BIM) is a process that involves the delivery and operation of built assets using well-structured, data rich, object-oriented digital information.
Building Information Modelling—

- Pile Design, Data Interoperability.
Building Information Modelling—

- Bearing Design, model can be shared with specialised bearing designers.
Building Information Modelling—

- Automate Bridge Setout information.
- Reduce manual data-entry.
- Reduce errors.
Process: Rebar Modelling—

- If it can’t be done here, what chance will they have on site?
Process: Rebar Modelling—

- Refine the design
Point Cloud and Photogrammetry—
Point Cloud of existing structure and the proposed 3D model allows us to communicate our designs with maintenance teams.
Process: Visualisation—

- Overlay bridge model with 2D design drawings to aid design intent.
Barriers to Digital Processes—

- Digital Engineering is more expensive.
- Deliver faster, more efficient projects.
- As consultants, we are being asked to provide information models full of data.
- Encourage staff to innovate better DE workflows.
- Build better client relationships.
In summary—

- The buzz words ‘Digital Engineering’ and ‘BIM’ will become normality.
- Emerging technologies will allow us to push the limits of design and construction of bridges.
- Authorities such as TMR, RMS and TfNSW will request BIM deliverables on projects.
- Overall, the future of bridge design and construction is looking very exciting.

Thankyou