

BIM@cit Integration & Communication

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Presentation Overview

- CIT Undergraduate BIM Education
- CIT BIM Research
- CIT BIM CPD Programme
- Concluding Remarks

CIT Undergraduate BIM Education

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Year #1 – Creativity, Innovation & Teamwork

- Students work in teams
- Projects vary in size and type
- Students' skills (e.g. communication, teamwork) and attitudes (e.g. motivation, ethics) are developed.



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Year #2 – 3D Built Environment Modelling

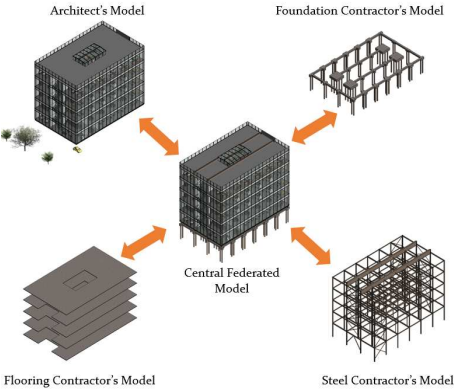
Exposure to Digital Technologies



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Year #3 – Structural Steel & Timber Design 2

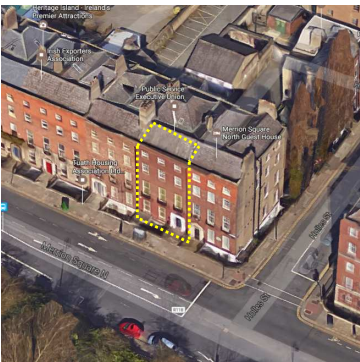
- Group design project
- Groups required to design the steel element of multi-contract design and build project
- A 'just-in-time' teaching approach is adopted
- Challenge is for 'teacher' to develop models of 'other' project stakeholders
- Individuals required to reflect and synthesise a strategy for improving performance



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Year #3 – Digital Structural Engineering – Typical Project

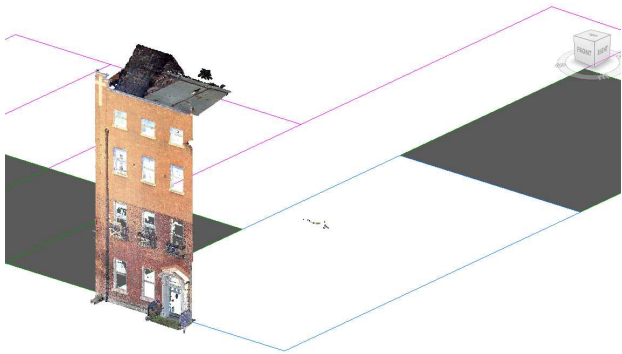
Point Cloud Data



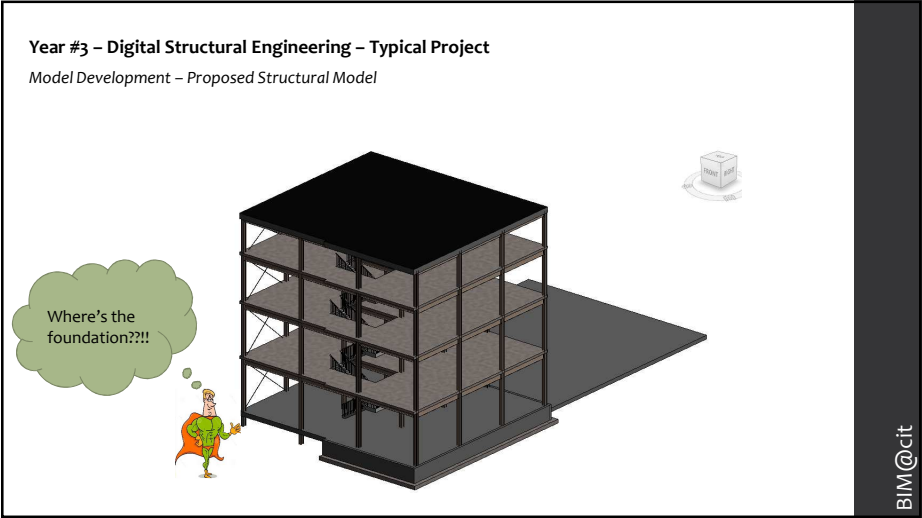
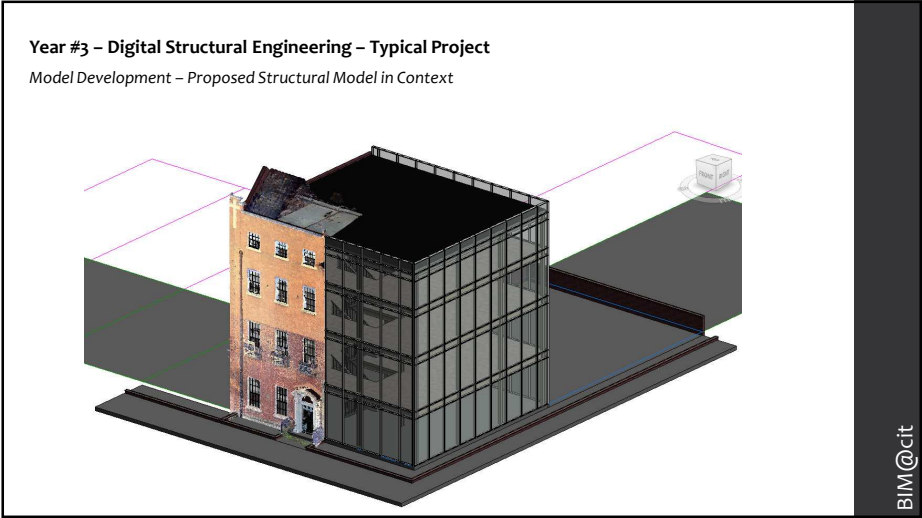
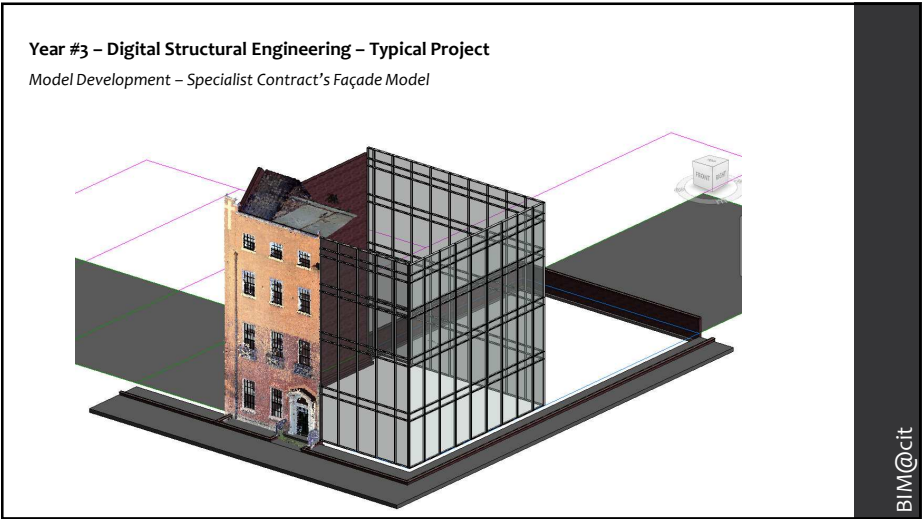
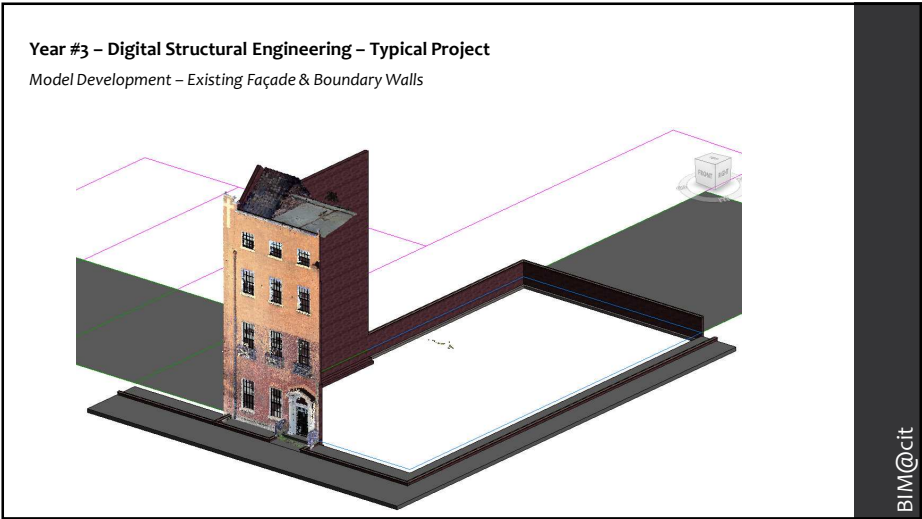
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Year #3 – Digital Structural Engineering – Typical Project

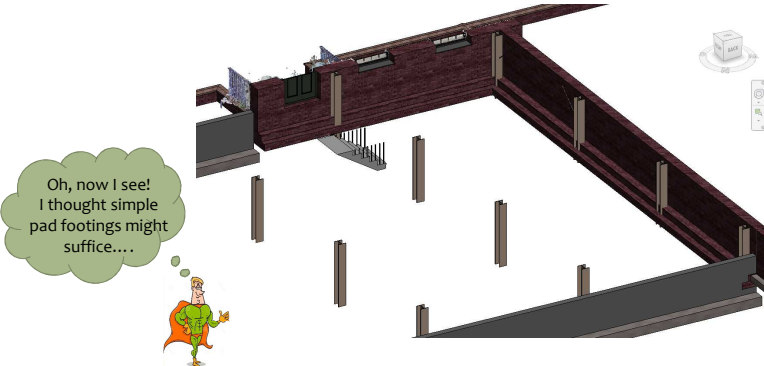
Model Development – Coordinating Existing Data



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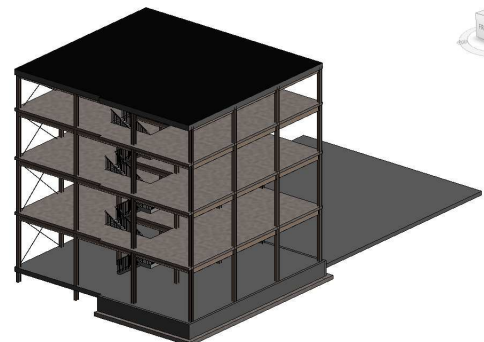
Year #3 – Digital Structural Engineering – Typical Project
Model Development – Benefit of 3D model for inexperienced designers!



Oh, now I see!
I thought simple
pad footings might
suffice....

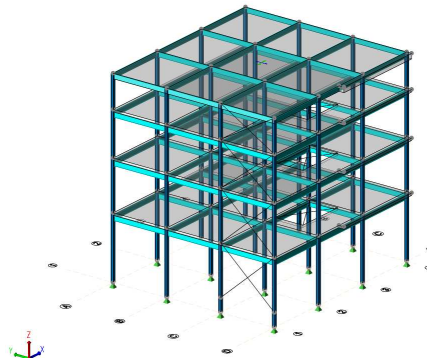
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Year #3 – Digital Structural Engineering – Typical Project
Model Development – Proposed Structural Model



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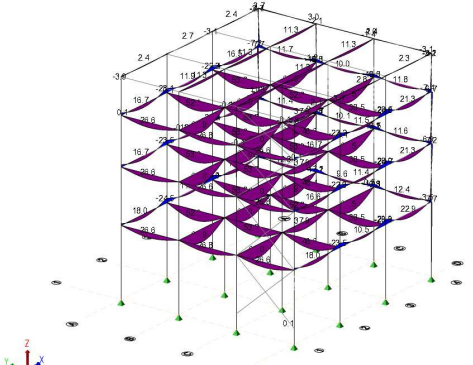
Year #3 – Digital Structural Engineering – Typical Project
Model Development – Revit to Tekla Structural Designer



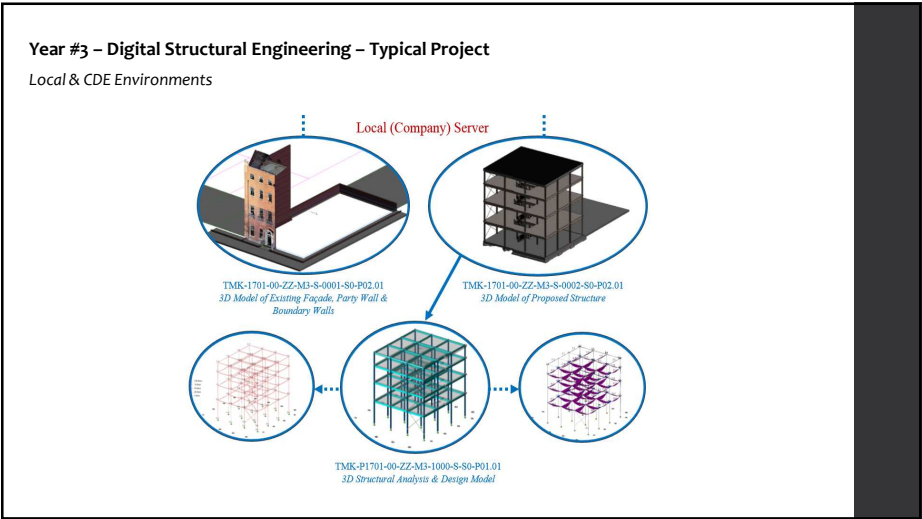
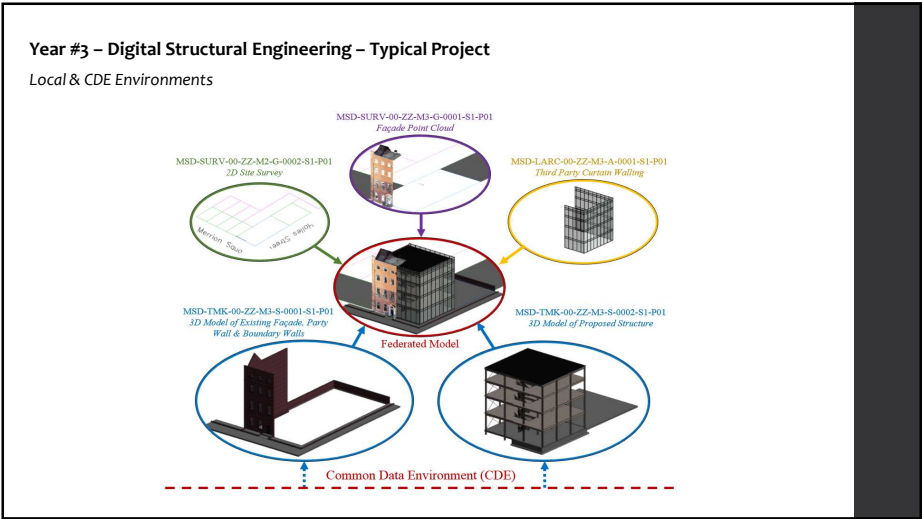
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Year #3 – Digital Structural Engineering – Typical Project
Model Development – Revit to Tekla Structural Designer

Moment Major 1D min/m ax = -29.9/68.5kNm



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Year #4 – Project Management & Leadership

- Fundamentals which underpin BIM are presented
- Students identify, summarise and critique a published BIM case study
- Assesses learner knowledge, understanding and attitudes towards BIM
- Approach seeks to extend the students' own learning experiences to the wider industry context

Crossrail
Ref: www.thebimhub.com/2014/08/07/canary-wharf-crossrail-station/#.WhXSniVVLJU

One World Trade Centre
Ref: www.aecom.com/projects/one-world-trade-center/

Panama Canal
Ref: www.thebim.com/video/expanding-panama-canal-with-bim

Year #4 – Design Office Collaboration Project

- Final year structural engineering and architectural technology students work in groups
- Each group is presented with a project brief
- Groups collaboratively undertake the concept stage (i.e. Stage 2 according to PAS 1192-2)
- All information is required to managed in accordance with BS/PAS 1192 series of standards
- Focus on the early phases of a project are twofold:
 - Time constraints within courses thus restricting scope to undertake a more complete design.
 - Placing emphasis on increased effort earlier in a project timeline is fundamental to a BIM approach, as it enables greater flexibility in decisions as illustrated by the MacLeamy curve

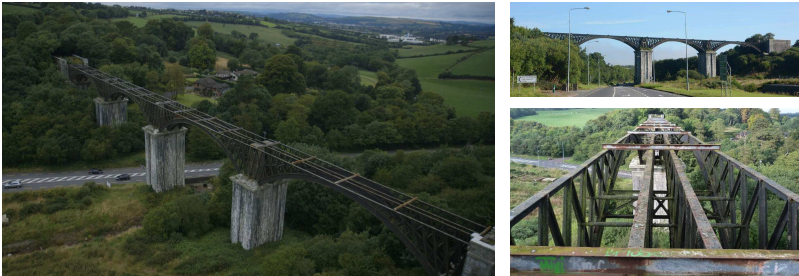
The 'holy grail' if expanded to include other disciplines!

CIT BIM Research

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Bridge Information Modelling (BrIM)

- Context:
- Almost all published research on the benefits of a BrIM approach relate to new construction projects.
 - Little evidence of BrIM adoption for existing infrastructure



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Bridge Information Modelling (BrIM)

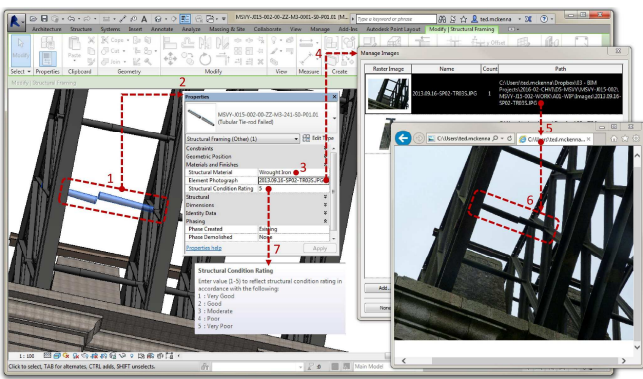
- Developed an ‘as-is’ BIM model based on laser scan point cloud data



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Bridge Information Modelling (BrIM)

- BIM model became the central source of information



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Bridge Information Modelling (BrIM)

Title:
Application of Bridge Information Modelling (BrIM) in the rehabilitation of the 19th Century Chetwynd Viaduct (Cork)

Student:
Nick Bailey

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Bridge Information Modelling (BrIM)

Context:

- Software interoperability (Communication!!) – significant concern amongst industry professionals

```
graph TD; A((Central BrIM Model)) --> B((1. Technical Assessment (Existing))); A --> C((2. Design Development (New Elements))); A --> D((3. Communication of Design Intent))
```

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Bridge Information Modelling (BrIM)

Key Outcomes:

- Analysis model directly derived from ‘as-is’ BrIM model
 - Non-BIM requires separate analysis model to be developed
 - Extra time / resources required
 - Opportunity for errors to be introduced
 - Overlapping / duplication of work
- Minor interoperability issues (*Revit* to *Robot*) encountered with section members which were not part of current industry standard catalogues.
 - Manual definition / mapping req’d in *Robot*
- Analysis results relatively comparable to non-BIM approach, however:
 - As-is BrIM model did not contain a slight bow (on-plan) present on the end spans – out of plane imperfections proved difficult to model in *Revit*
 - Such imperfections were present in ‘non-BIM’ model

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Bridge Information Modelling (BrIM)

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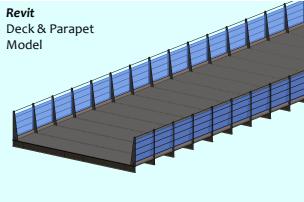
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Bridge Information Modelling (BrIM)

Revit
Combined (Federated)
Model



Revit
Deck & Parapet
Model



Key Outcomes:

1. Successful adoption of federated model strategy, whereby multiple sub-models (existing and proposed) were combined into one central model (single ‘source of truth’)

2. Full Analysis and Design of proposed rehabilitation works to Eurocode 1993-1

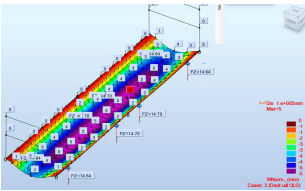
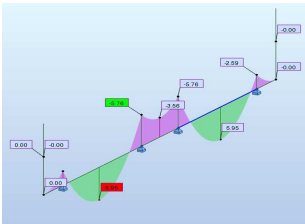
- Analysis model directly derived from BrIM model
- Updates to analysis model (optimisation) automatically updated in BrIM model
 - Non-BIM:** Revisions to analysis model require to be manually replicated in all other drawings / models / schedules, etc

3. Constructing Sequencing / Buildability appraisal directly derived from BIM *Revit* model

- Non-BIM:** Separate dedicated models to be developed

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Bridge Information Modelling (BrIM)



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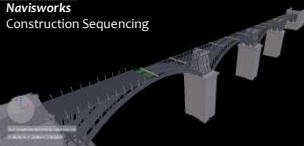
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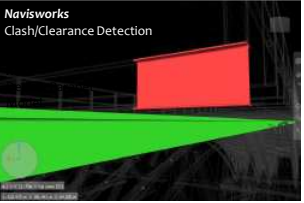
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Bridge Information Modelling (BrIM)

Navisworks
Construction Sequencing



Navisworks
Clash/Clearance Detection



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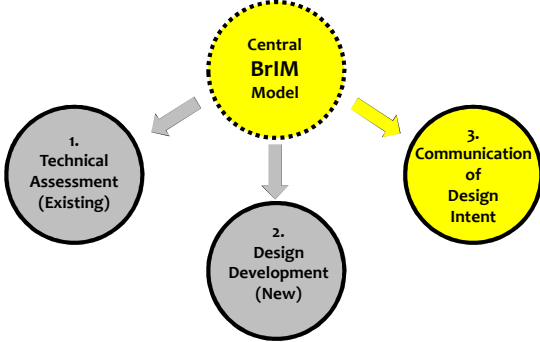
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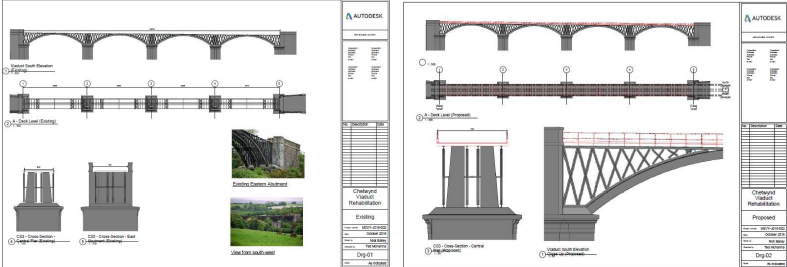
Bridge Information Modelling (BrIM)



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Bridge Information Modelling (BrIM)

Non-BIM presentation material consisted of A1 drawing sheets which contained 2D plans, elevations and sections, showing an ‘existing and proposed’ of the rehabilitation works.



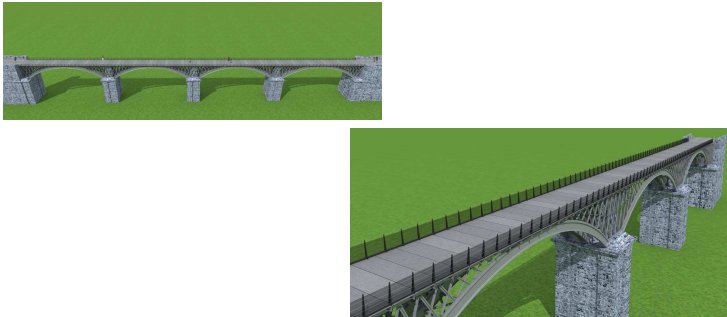
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Bridge Information Modelling (BrIM)

BIM approach included;

- 3D visualisations – various views
- Overhead projector displaying flyby animation
- Virtual Reality (VR) Headset

➤ Each directly output from central BIM model



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Bridge Information Modelling (BrIM)

Research Conclusions:

1. A BrIM workflow can be successfully adopted on a project involving a heritage listed structure
 - Significant efficiencies can be realised due to sharing of central common model
 - Key challenge - Method of developing an accurate ‘as-is’ BrIM model from the initial survey data (Scan-to-BIM)
2. Successful software interoperability
 - Multiple software packages exploited central BIM model for differing tasks
 - Minor interoperability concerning non-standard section types
3. BIM adopted workflow is superior to that of a traditional non-BIM approach, in terms of the communication of a design intent by its core deliverables.

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Bridge Information Modelling (BrIM)



2017/18 Winner of the Institution of Structural Engineers Best Final Year Project

Title: Application of Bridge Information Modelling (BrIM) in the rehabilitation of the 19th Century Chetwynd Viaduct (Cork)

Student: Nick Bailey

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9

CIT BIM CPD Programme

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Certificate in Building Information (BIM) Technologies

CPD Programme – Commenced in September 2015
This programme provides an opportunity for architectural, engineering and construction degree graduates, or qualifying students, to acquire effective skills and knowledge in the application of Building Information Modelling (BIM) methodologies and technologies within a multi-disciplinary and collaborative approach to building design and construction.

Modules: 3D Built Environmental Modelling / Introductory GIS
 Collaborative BIM 1
 Collaborative BIM 2

Delivery: September-December 2015, 2016, 2017,2018.....

Link: www.cit.ie/course/CRCBIMG7

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Testimonial Extracts

“This is an excellent course and delivered by real professionals....”
John O’Connell, Architectural & Metal Systems (AMS) Ltd.

“.....multi-disciplinary approach accommodates all students from any of the Architecture, Engineering and Construction industries,”
Fiona O’Sullivan, Architectural Technologist, RKD Architects

“.....I recommended the CIT Certificate in BIM to both colleagues and external professionals. The course is a brilliant idea and superbly delivered.”
Leonard McCarthy

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Concluding Remarks

In Conclusion

- CIT is well progressed in terms of producing BIM literate and capable graduates
- CIT has established research links with industry... producing award winning results!
- CIT supports industry with the increasingly popular **Certificate in BIM Technologies** SPA
- CIT welcomes comments, queries, collaborations.....

Any Questions