Providing Collaborative Education with an International Dimension. An Ulster University & Pennsylvania State University Case Study

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Introductions – The Collaborative Team

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Introductions – The Collaborative Team

*Ulster University, Faculty of Art Design & the Built Environment*
Programmes spanning the full spectrum of AEC professions (with exception of landscape design).

*Belfast School of Architecture*
Some programmes located in Belfast, Architectural Technology and Management based in the Jordanstown campus

*School of the Built Environment*
All programmes based in Jordanstown campus including Building Surveying, Quantity Surveying, Civil Engineering, Construction Engineering, MEP Engineering etc.
Focus of the Paper

Highlight collaborative BIM working practices developed within the three main discipline areas.

Overview of pilot collaborative project between ATM and QSCM students in the 2013/14 academic year.

Enhancements introduced in the 2014/15 academic year to include CE students and students from PSU, USA.

Use of a leading industry standard Common Data Environment (CDE) to facilitate international collaboration.
Origins of the Project – Drivers

Architectural Technology
Relatively new discipline, focused on technical design providing a “skill set that allows them to communicate effectively with the other design disciplines to in effect provide a central point of coordination for building information” (Matthews, 2013)

Civil Engineering
Traditional profession – large multi-disciplinary projects, communication is vital, need skills to express design intent.

Quantity Surveyors
Insecurity? IT revolution has been threatening profession for decades, but professional services are enhanced by embracing IT solutions.
Origins of the Project –

**Structural Barriers to Collaborative Education**

- Lack of reference materials
- Difficulties in learning and using BIM software;
- Misunderstanding of the BIM process and issues related to the circumstances of the academic environment
- Hierarchical structure within higher education institutions
- Programmes located within different schools,
- Programmes located in different campuses.
- Resources required to teach use of BIM tools vs needs / expectations of industry.
- Risk of silo mentality if focus too much on software expertise.
Origins of the Project –

*Structural Barriers to Collaborative Education*

*Options*

Collaboration between / with:

- Disciplines within the same institution,
- Disciplines in other institutions (including international collaboration),
- Industry professionals to simulate real life projects or
- A combination of the aforementioned
First Collaborative Project

2013/14 Academic Year

- Meeting of BIM Academic Forum (BAF) in London
- Discussed the barriers to interdisciplinary BIM education
- Started small – initially AT&M and QS
- Found complimentary modules in Year 2, Semester 2
  - ATM develop designs / models
  - QS take models and prepare 4D, 5D simulations / cost plans and add comments within NavisWorks / Causeway BIM Measure / Microsoft Project.
- Adapted VLE to create the CDE with basic folder structures (BS1192(2007) and permissions.
First Collaborative Project

2013/14 Academic Year

How were Learning Outcomes Enhanced without need for heavy admin?

- ATM & QS module LOs remained the same.
- ATM students made their models available to QS students at agreed times.
- QS students had unique designs to work on instead of everyone using the same models / designs.
- Enhanced by RFIs via NavisWorks saved views and combined project team presentations.
- Shared files using an adapted VLE / CDE and using file naming convention from BS1192(2007)/PAS1192:2
- Best Team – Prize
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International Dimension and Industry Standard CDE
International Dimension & Industry Standard CDE

2014/15 Academic Year

- Groups consisted of:
  - 1 x ATM student
  - 1 or 2 QS students
  - 1 or 2 CE students
  - 1 PSU student to 5 or 6 groups / ATM students – i.e. 1 landscape design allocated to the 5 or 6 groups.
International Dimension & Industry Standard CDE

- Original plan was always to expand collaboration
- Enthusiastic engagement from Civil Engineering for Structural Input & PSU for Landscape Architecture Input.
- Industry leading CDE service providers approached – Asite volunteered:
  - full suite of services
  - training to academic staff
  - Set-up 28 project areas for various project teams / permissions with basic BS1192 (2007) folder structures etc.
  - Access by students from 4 programmes, across 3 schools and 2 continents.
International Dimension & Industry Standard CDE

*Enhancements – 2nd Iteration – 2014/15*

- Leica Geosystems volunteered to undertake a laser scan / point cloud survey:
  - Survey existing site location
  - Facilitate coordination of design with site constraints

- Included a basic EIR & BEP
  - Required the models to be exported as .dwfx and .ifc files for use in Causeway’s BIM Measure + Autodesk’s NavisWorks and Asite’s CDE.
International Dimension & Industry Standard CDE

*Enhancements – 2\textsuperscript{nd} Iteration – 2014/15*

- Scenario was basically the same as before – Sports Pavilion changed to hall of residence on campus.
- ATM & QS student tasks - as before.
  - Saved views and red line mark-ups via Asite tool or NavisWorks
- CE engagement (1\textsuperscript{st} Year) – accessing the designs on CDE and calculating sizes of structural members to support openings using Revit and MasterSeries.
- PSU students to develop landscaping proposals for overall scheme designs from basic site plans developed by ATM students and shared on CDE.
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Challenges & Lessons Learnt
Challenges and Lessons Learnt

Student feedback was again positive.

However everyone involved, including the academics, learned from issues that developed during the project. These included:

1. Reliance on Participation
2. File formats
3. CDE familiarity
4. Limitations of point clouds
5. Need for common goals to encourage more collaboration
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Conclusions
Conclusions

Both projects have encountered problems that were:

- unique, challenging and unusual, but
- proved very valuable, providing essential learning for the students and academics alike.
- informing preparations / contingencies for future projects.
- Informing design of multidisciplinary BIM modules
  - Flexible offering 20 CP or 10 CP versions that have aligned LOs.
  - Level 4 modules adopted by QS, CEM, AEng, Energy.
- Full potential of CDE not realised yet – however great for finding files published by particular students.
- Positive feedback from students and industry
- Collaborative working is achievable and valuable