



BIM Education - A Multidisciplinary Analysis

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The CITA BIM Gathering

14th - 15th November 2013
at the Guinness Storehouse



BIM Education – A Multidisciplinary Analysis

David Comiskey, Robert Eadie, Mark McKane, Mark Hamill, Gareth Alexander & Robert Weatherup – University of Ulster



Current Trends:

Discipline Specific BIM – 90%
Interdisciplinary BIM – 7%
Distance Collaboration – 3%

Barison & Santos, 2010

“(80.43%) felt that collaborative approaches to management of their supply chains were either Critical (36.96%) or Important (43.47%) to their organisations.”

Taggart et al, 2012

“Various studies suggest that universities are lagging behind the construction industry in terms of adopting BIM technologies and improved collaborative working practices (e.g. Becerik-Gerber et al 2011, Allen Consulting Group 2010, Forgues et al 2011).”

Macdonald, 2011

“...there are barriers to change built into our Universities and Colleges, not least of which is the entrenchment of the traditional professions. In an ideal world these institutions should be microcosms of the way we desire the industry to work in the future.”

Lockley, NBS BIM Report 2011

Possible Reasons for Lack of Collaboration

Staff Reluctance

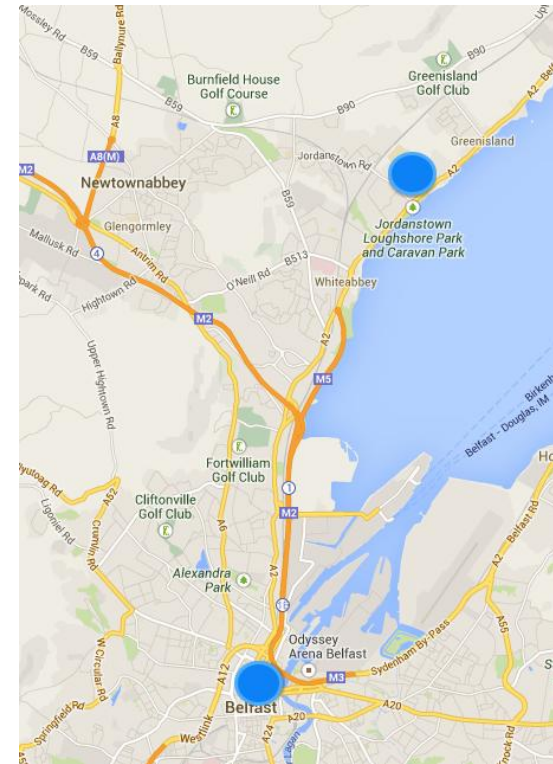
Physical Environment

Timetabling

Software Issues

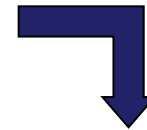
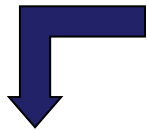
Hierarchical Structure

Professional Bodies/Subject Benchmark Statements



Current BIM Implementation at the University of Ulster

FACULTY OF ART, DESIGN & BUILT ENVIRONMENT



School of Built Environment

Belfast School of Architecture



Building Engineering & Materials
Building Surveying
Civil Engineering
Construction Engineering & Management
Energy & Building Services Engineering
Quantity Surveying & Commercial Management

Architectural Technology & Management
Architecture

The Study:



Employers



Academics



Students

Response Rate

41%

56%

58%

Employers:

Answer	Count	Percentage
Micro - Less than or equal to 5 employees (A1)	10	28.57%
Micro - Greater than 5 employees but less than or equal to 10 employees (A2)	5	14.29%
Small - Greater than 10 employees but less than or equal to 25 employees (A3)	4	11.43%
Small - Greater than 25 employees but less than or equal to 50 employees (A4)	4	11.43%
Medium - Greater than 50 employees but less than or equal to 125 employees (A5)	4	11.43%
Medium - Greater than 125 employees but less than or equal to 250 employees (A6)	4	11.43%
Large - Greater than 250 employees (A7)	4	11.43%
No answer	0	0.00%

Employers:

Do you understand what level 2 BIM is?

Answer	Count	Percentage
Yes (Y)	19	54.29%
No (N)	16	45.71%
No answer	0	0.00%

We have not used it but are open to exploring its potential value for us (3A4)	14	40.00%
We have not used it but are actively evaluating it (3A5)	7	20.00%
No answer	0	0.00%

Staff:

Answer	Count	Percentage
Architectural Technology (A1)	0	0.00%
Architecture (A2)	4	16.67%
Quantity Surveying (A3)	4	16.67%
Building Engineering and Materials (A4)	0	0.00%
Engineering (A5)	8	33.33%
Construction (A6)	6	25.00%
Other	2	8.33%
No answer	0	0.00%

Students:

What Course are you currently studying?

Answer	Count	Percentage
Architectural Technology (G1)	31	21.53%
Quantity Surveying (G2)	42	29.17%
Civil Engineering (G3)	38	26.39%
Building Engineering and Materials (G4)	5	3.47%
Construction Engineering and Management (G5)	28	19.44%
Other	0	0.00%
No answer	0	0.00%

Employers:

In your opinion, how should introductory level BIM process/software be taught within undergraduate AEC programmes?

Answer	Count	Percentage
As a standalone module within a specific discipline area dealing solely with software (8A1)	2	5.71%
As a standalone module within a specific discipline area dealing solely with theory (8A2)	1	2.86%
As a standalone module within a specific discipline area dealing with both theory and software (8A3)	7	20.00%
Not as a standalone module but integrated within other modules within a specific discipline area (8A4)	6	17.14%
As a standalone module and in collaboration with other built environment courses, dealing solely with software (8A5)	0	0.00%
As a standalone module and in collaboration with other built environment courses, dealing solely with theory (8A6)	0	0.00%
As a standalone module and in collaboration with other built environment courses, dealing with both theory and software (8A7)	12	34.29%
I do not have an opinion (8A8)	6	17.14%
Other	0	0.00%
No answer	1	2.86%

Staff:

In your opinion, how should introductory level BIM process/software be taught within undergraduate AEC programmes?

Answer	Count	Percentage
As a standalone module within a specific discipline area dealing solely with software (5A1)	0	0.00%
As a standalone module within a specific discipline area dealing solely with theory (5A2)	0	0.00%
As a standalone module within a specific discipline area dealing with both theory and software (5A3)	6	25.00%
Not as a standalone module but integrated within other modules within a specific discipline area (5A4)	8	33.33%
As a standalone module and in collaboration with other built environment courses, dealing solely with software (5A5)	0	0.00%
As a standalone module and in collaboration with other built environment courses, dealing solely with theory (5A6)	0	0.00%
As a standalone module and in collaboration with other built environment courses, dealing with both theory and software (5A7)	9	37.50%
I do not have an opinion (5A8)	1	4.17%
Other	0	0.00%
No answer	0	0.00%

Students:

In your opinion, how should introductory level BIM process/software be taught within undergraduate AEC programmes?

Answer	Count	Percentage
As a standalone module within a specific discipline area dealing solely with software (A101)	13	9.03%
As a standalone module within a specific discipline area dealing solely with theory (A102)	1	0.69%
As a standalone module within a specific discipline area dealing with both theory and software (A103)	55	38.19%
Not as a standalone module but integrated within other modules within a specific discipline area (A104)	20	13.89%
As a standalone module and in collaboration with other built environment courses, dealing solely with software (A105)	8	5.56%
As a standalone module and in collaboration with other built environment courses, dealing solely with theory (A106)	3	2.08%
As a standalone module and in collaboration with other built environment courses, dealing with both theory and software (A107)	32	22.22%
I do not have an opinion (A108)	9	6.25%
Other	2	1.39%
No answer	1	0.69%

Employers:

In your opinion, how should advanced level BIM process/software be taught within undergraduate AEC programmes?

Answer	Count	Percentage
As a standalone module within a specific discipline area dealing solely with software (9A1)	1	2.86%
As a standalone module within a specific discipline area dealing solely with theory (9A2)	0	0.00%
As a standalone module within a specific discipline area dealing with both theory and software (9A3)	3	8.57%
Not as a standalone module but integrated within other modules within a specific discipline area (9A4)	3	8.57%
As a standalone module and in collaboration with other built environment courses, dealing solely with software (9A5)	1	2.86%
As a standalone module and in collaboration with other built environment courses, dealing solely with theory (9A6)	0	0.00%
As a standalone module and in collaboration with other built environment courses, dealing with both theory and software (9A7)	20	57.14%
I do not have an opinion (9A8)	6	17.14%
Other	0	0.00%
No answer	1	2.86%

Staff:

In your opinion, how should advanced level BIM process/software be taught within undergraduate AEC programmes?

Answer	Count	Percentage
As a standalone module within a specific discipline area dealing solely with software (6A1)	0	0.00%
As a standalone module within a specific discipline area dealing solely with theory (6A2)	0	0.00%
As a standalone module within a specific discipline area dealing with both theory and software (6A3)	7	29.17%
Not as a standalone module but integrated within other modules within a specific discipline area (6A4)	6	25.00%
As a standalone module and in collaboration with other built environment courses, dealing solely with software (6A5)	0	0.00%
As a standalone module and in collaboration with other built environment courses, dealing solely with theory (6A6)	0	0.00%
As a standalone module and in collaboration with other built environment courses, dealing with both theory and software (6A7)	10	41.67%
I do not have an opinion (6A8)	1	4.17%
Other	0	0.00%
No answer	0	0.00%

Students:

In your opinion, how should advanced level BIM process/software be taught within undergraduate AEC programmes?

Answer	Count	Percentage
As a standalone module within a specific discipline area dealing solely with software (A101)	17	11.81%
As a standalone module within a specific discipline area dealing solely with theory (A102)	1	0.69%
As a standalone module within a specific discipline area dealing with both theory and software (A103)	54	37.50%
Not as a standalone module but integrated within other modules within a specific discipline area (A104)	16	11.11%
As a standalone module and in collaboration with other built environment courses, dealing solely with software (A105)	6	4.17%
As a standalone module and in collaboration with other built environment courses, dealing solely with theory (A106)	2	1.39%
As a standalone module and in collaboration with other built environment courses, dealing with both theory and software (A107)	34	23.61%
I do not have an opinion (A108)	12	8.33%
Other	0	0.00%
No answer	2	1.39%

Employers:

Determine the level at which you agree with the following statement. An adoption of BIM technology education as a core curriculum component, would likely lead our company to offer placement/graduate positions to those students with BIM skills vs. those who do not have BIM skills in the next 5 years?

Answer	Count	Percentage	Sum
1 (1)	0	0.00%	8.82%
2 (2)	3	8.82%	
3 (3)	11	32.35%	32.35%
4 (4)	10	29.41%	
5 (5)	10	29.41%	58.82%
No answer	1	2.86%	
Arithmetic mean	3.79		
Standard deviation	0.98		
Sum (Answers)	34	100.00%	100.00%
Number of cases	35	100.00%	

5 = Strongly Agree / 4 = Agree / 3 = Neither Agree nor Disagree / 2 = Disagree / 1 = Strongly Disagree

Staff:

Determine the level at which you agree with the following statement. An adoption of BIM technology education within my programme has (or would) lead to greater employment opportunities for students within the profession?

Answer	Count	Percentage	Sum
1 (1)	1	4.17%	4.17%
2 (2)	0	0.00%	
3 (3)	9	37.50%	37.50%
4 (4)	7	29.17%	
5 (5)	7	29.17%	58.33%
No answer	0	0.00%	
Arithmetic mean	3.79		
Standard deviation	1.02		
Sum (Answers)	24	100.00%	100.00%
Number of cases	24	100.00%	

5 = Strongly Agree / 4 = Agree / 3 = Neither Agree nor Disagree / 2 = Disagree / 1 = Strongly Disagree

Students:

Determine at what level you agree with the following statement. Knowledge of BIM (theory and/or software) has enhanced my self-confidence when applying for a job?

Answer	Count	Percentage	Sum
1 (1)	13	9.09%	23.08%
2 (2)	20	13.99%	
3 (3)	48	33.57%	33.57%
4 (4)	44	30.77%	
5 (5)	18	12.59%	43.36%
No answer	1	0.69%	
Arithmetic mean	3.24		
Standard deviation	1.13		
Sum (Answers)	143	100.00%	100.00%
Number of cases	144	100.00%	

5 = Strongly Agree / 4 = Agree / 3 = Neither Agree nor Disagree / 2 = Disagree / 1 = Strongly Disagree

Staff:

Do you think collaboration between disciplines in the teaching of BIM is important?

Answer	Count	Percentage
Yes (Y)	23	95.83%
No (N)	1	4.17%
No answer	0	0.00%

Do you feel you require more training on BIM processes generally/ specific to your subject area?

Answer	Count	Percentage
Yes (Y)	21	87.50%
No (N)	3	12.50%
No answer	0	0.00%

Barriers in Education

“Cross school working is not easy and therefore a barrier, but not an insurmountable one”

“Level of awareness, the level of awareness BIM appears to be very variable. Resistance, a reluctance on the part of teachers to engage with new and developing technologies. BIM software has some way to go before it becomes truly joined up. The interoperability of various software platforms”

“Barriers are likely to be the usual workload and delivery issues associated with different disciplines, many with their own professional criteria, and their approach to issues such as BIM”

“Particular disciplines need to know how to use it specific to them, they do not need to know how others use it in the same detail”

“Protectionism by some disciplines”

Comments

“...the use of BIM in industry will be an interdisciplinary process. If it is not taught across courses it will just be a drawing module”

“Integrated design is the only means by which BIM can be delivered successfully, hence teaching has to imbibe students with that ethos”

“Training the trainers to advanced level of proficiency is key to delivering BIM teaching strategy. As one cannot give what he does not have, no more can a lecturer teach BIM to help students develop advanced skills needed by the industry by 2016 if the lecturer is not trained to an advanced level himself/herself”

“I have experience of BIM in practice - REVIT & Archicad - it does not necessarily lead to better design - it does dictate + rationalise the delivery process - this extent can actually hamper more poetic / excellent design. However, it will definitely be industry standard in the very near future and to this extent it is a serious employability issue”

Moving Forward:

PRELIMINARY BIM LEARNING OUTCOMES FRAMEWORK (July 2012)

STRATEGIC

Overview In relation to each of the learning outcomes below, as a result of following this course, individuals will be expected to:

O1

What is BIM

Understand the principles of Building Information Modelling and its application to the whole life inter-disciplinary design, construction and use of building and infrastructure developments

O2

BIM Value proposition (context relevant, e.g. client and contractor)

Understand the value proposition that BIM offers enabling adopters to more efficiently:
Identify and evaluate stakeholder, user, community and sustainability project requirements
Prepare project briefs and development programmes
Assess and manage project risks and opportunities
Prepare and present project design recommendations
Assess, plan, estimate and control proposed development energy, whole life and capital costs
Model and analyse production and installation project design solutions
Plan and agree detailed project designs
Analyse and plan project resources and work processes
Establish project work teams and organisational systems
Manage project handover guidance, completion and feedback
Develop and implement property and facilities management plans

O3

What is the Government requirement from BIM

Understand the Government's requirements regarding the adoption of BIM on public projects in order to:
Identify, assess and agree project requirements and stakeholder preferences
Establish project team partnering
Assess and manage project risks and opportunities
Plan and control proposed capital costs
Build your organisation's understanding of its market and customers
Manage business processes and improve performance

References:

Barison, M. B. and Santos, E.T. (2010) “BIM teaching strategies: an overview of current approaches”, Computing in Civil and Building Engineering, Proceedings of the ICCCB2010, Nottingham, UK, pp. 577. Available at <http://www.engineering.nottingham.ac.uk/icccb2010/proceedings/pdf/pf289.pdf>

Macdonald, J. (2011) BIM – Adding Value by Assisting Collaboration. Available online: http://www.academia.edu/1767394/BIM_ADDING_VALUE_BY_ASSISTING_COLLABORATION

NBS (2011) Building Information Modelling Report March 2011. RIBA Enterprises Ltd.

Taggart, M., Koskela, L. and Rooke, J. (2012) Collaborative supply chain practices during severe economic downturn in the Republic of Ireland In: Smith, S.D (Ed) Procs 28th Annual ARCOM Conference, 3-5 September 2012, Edinburgh, UK, Association of Researchers in Construction Management, 687-695.

Images:

<http://tinyurl.com/l7bukml>

<http://tinyurl.com/nv2dels>