

Developing and supporting the curriculum

BIM-driven Curriculum for Built Environment

School of Built Environment

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2	Key words: Building Information Modelling, Curriculum development, Built Environment
3	Overview: Building Information Modelling (BIM) is a new concept and supported technologies that are emerged mainly to facilitate the interdisciplinary working environment of the construction industry. HEA has recommended that Higher Education should develop new curricula and efficient CPD courses on BIM Education for Architecture/Engineering/Construction professionals to meet the new requirements for professional accreditation.
4	Background/context: This study aims to develop an integrated BIM-driven curriculum for all programmes taught in the School of Built Environment. This includes defining the knowledge and skills that should be specified at different levels of study. It also provides an indication of the learning resources required to support the effective delivery of this BIM-driven curriculum. The curriculum targets the emerging needs of new skills for civil/structural engineers, architectural engineers, design/project managers, and quantity surveyors to set up the efficient multidisciplinary collaboration in the design and construction processes with the support of the advanced BIM technologies.
5	Activities/example of practice: The curriculum development team has been formed from all teaching programmes and IT support team in the school. The curriculum development also adopted the approach of active student participation in curriculum design and delivery, which becomes a growing interest within Higher Education (HE). Therefore, groups from the current built environment students have been involved. The adopted methodology to conduct the work included: 1) Comprehensive Literature review on utilising BIM technology in industry and education. 2) The project required extensive data from different relevant sources, namely; other HE institutions, BIM development companies, and construction industry companies. Therefore, 3 bodies from each have been contacted to gain their input into the curriculum development. 3) The involvement of students in this study was promoted by a survey that explored students' experiences of BIM utilisation in the Built Environment fields, their needs and expectations. Some interviews were also conducted to get further views. 4) Data collected was analysed using descriptive statistics and thematic analysis. 5) As the curriculum development is dynamic and cyclic, the development ran across all stages of the study. The reviews and feedback from students and staff were collected and analysed in several meetings between the study team and other interested staff in the school.
6	Key points including challenges: The QAA Scotland indicated that Interdisciplinary Learning is one of the main four categories to achieve the totality of experiences identified by Curriculum for Excellence. This experience needs to be reinforced by HE curriculums in specific contexts. This study helped in this direction as it is mainly based on the interdisciplinary nature of the built environment and how the new technology (BIM) can convert the collaborative working from just a taught concept into practical and effective experience. The study also has an impact on the employability of students as the uptake of BIM technologies is extensively growing worldwide. Therefore, different managerial, technical and interpersonal skills to deliver better value through integrated design are targeted to be met by this curriculum, such as: working collaboratively throughout design development, applying digital and media technologies to generate and communicate innovative design solutions. These technical and reflective skills are of immediate advantage to employers in construction, engineering and design roles

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	across the built environment. The curriculum developed has benefited from the state-of-the-art research and teaching at University and the international BIM efforts and adoption that provide integrated BIM implementation strategies and solutions to the ongoing problems within the industry, such as: integrated processes, clash detection, improved design coordination, improved value to clients and users, information management and exchange, and improved sustainability outcomes. The designed curriculum has also considered the different mode of studied for on-campus and distance learning students. The main objectives achieved include: 1. Defining the needs of the learners and the scope of the curriculum content according to the requirements of industrial/professional bodies 2. Determining the broad learning outcomes (general and programme specific) across all programmes 3. Identifying the main content of teaching and learning relevant to BIM to achieve these learning outcomes 4. Identifying methods to achieve the learning outcomes and the sequence of the main topics and the key assessments 5. Identifying the IT requirements to run these programmes to be included in the school strategic plan The main challenge identified by the study team was to fit all these objectives in all programmes of the multi-disciplinary Built Environment without compromising the main core objectives of each programme.
7	Sharing good practice: As the developed BIM-driven curriculum is considered the first within a Scottish Higher Education institution in this nature, this will strengthen the University profile and create a great opportunity to share the experience with other institutions in a wider impact. The team members involved in developing the curriculum was from all programmes in the institution. Acting as a champion, each member has been allocated a specific role to disseminate the good practice within her/his programme to run the curriculum and maybe for further development. On the other hand, the delivery of this curriculum will benefit from the established links by the institution with industry over the last decades. In a wider impact and given the strong profile of the institution staff in BIM application and development, there is also high potential to support efficient CPD courses for the industry and help develop step-by-step procedures for integrating BIM into their project delivery process. There is high demand within the industry to find guidance towards the full transformation of the Built Environment in the very near future.
8	Where to next: As the institution runs its programmes across many campuses worldwide, this study has established the basis to develop a global curriculum for Built Environment programmes across all campuses. It is challenging despite that all programmes have the same structure, but the people involved have various attitudes and approaches. The collaborative environment should consider teams of students (future practitioners) working in remote places, which is the aim of the work currently under investigation.
9	Additional information: Further information about the study outcomes can be obtained by contacting the author.