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BIM GATHERING



Building Capabilities in Complex Environments

CitA BIM Gathering 2017, Croke Park, November 23rd & 24th, 2017



Grangegorman
Development Agency
Gníomhaireacht Forbartha
Ghráinseach Ghormáin



School of
Multidisciplinary
Technologies
Engineering and the
Built Environment



Dublin School of Architecture



The School of Surveying and
Construction Management



**Linking Geospatial Engineering into Collaborative Multidisciplinary BIM
Projects an Educational Perspective**

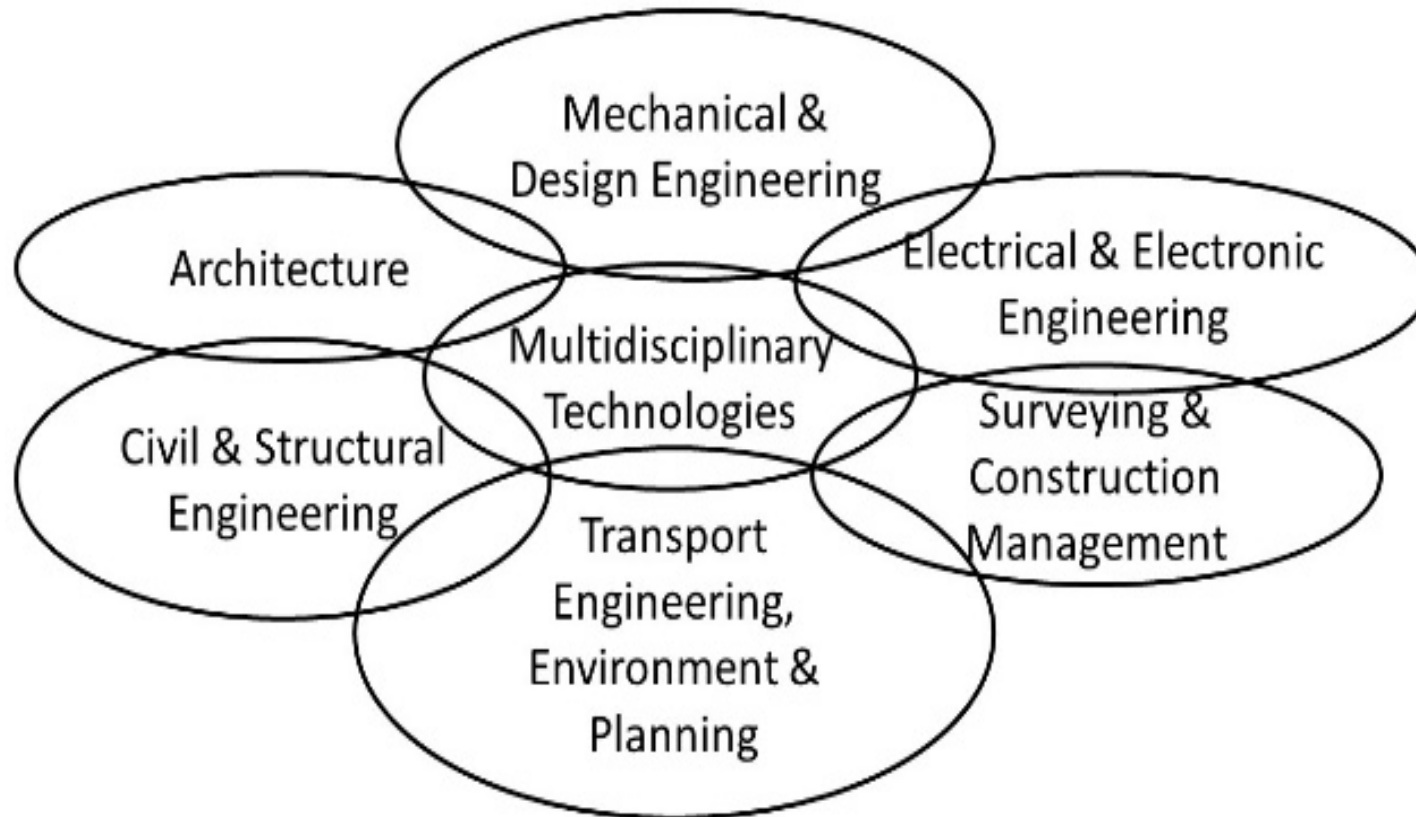


**“BIM does not apply abstractions or
simplifications; all components are represented
with their true 3D shape”**

Sisi Zlatanova and Umit Isikdag

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MSc in applied Building Information Modelling & Management

Specialisation MSc for Architects,
Technologists, Construction Managers,
Quantity Surveyors, Geomatics
Surveyors, Engineers – Building,
Mechanical, Electrical, Civil & Structural

2.5 years part-time

Evening attendance

Multidisciplinary Collaboration Project

MSc in Geospatial Engineering

Conversion MSc – backgrounds in
geography, forestry, environment, etc.

1-year whole-time

Daytime attendance

Work Placement Module:

Survey Team under supervision of a
Chartered Geomatics Surveyor

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CloudCompare

3D point cloud and mesh processing software
Open Source Project



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File Naming Protocol



Project (AAAA) Code	Originator (BBB) Code Company		Volume / System (CC) Code Building, area, phase or zone		Level (DD) Code Level		Type (EE) Code Document type	Role (F) Code Role		Number (GGGGG) Code	
FSE	ABC	Client Ltd	00	Multiple buildings, areas, phases or	GF	Ground Floor	DR	Drawing	A	Architect	10001
	DEF	Architect Ltd	01	Block 1	01	First Floor	M2	Two Dimensional Model	B	Building Surveyor	
	GHI	Structural Engineer Ltd	02	Block 2	02	Second Floor	M3	Three Dimensional Model	C	Civil Engineer	
					03	Third Floor	MR	Model Rendering	D	Drainage, Highways Engineer	
					04	Forth Floor	PR	Programme	E	Electrical Engineer	
					ZZ	Multiple Levels (eg sections)	RD	Room data sheet	F	Facilities Manager	
					XX	No Levels Applicable (eg typical detail)	RP	Report	G	Geographical and Land Surveyor	
							SA	Schedule of Accommodation	H	Heating and Ventilation Designer	
							CA	Calculations	I	Interior Designer	
							SH	Schedule	K	Client	
							SP	Specification	L	Landscape Architect	
							SU	Survey	M	Mechanical Engineer	
									P	Public Health Engineer	
									Q	Quantity Surveyor	
									S	Structural Engineer	
									T	Town and Country	
									W	Contractor	
									Y	Specialist Designer	
									Z	General (non-	



Grangegorman Clocktower Survey
January 2017
Client Survey Specification

Required

3D topographic information to 1:100 scale for Clocktower surroundings

Fully-connected, measured building survey of the exterior and interior of portions of the
Clocktower building

Point cloud survey sufficient to produce a LOD 300 (Level 3) - Standard Survey Model of
the exterior and interior of portions of the Clocktower building and including Level of
Information (LOI) 300



RAW POINT CLOUD DATA

To be delivered in the following formats:

1. Instrument(s) native format(s) (clr etc.)
2. E57 interchange format (V1.0 E57 file format as approved by the ASTM standard E2807).

POINT CLOUD PROCESSING

Any point cloud processing undertaken must retain the original survey points and not interpolate or filter the data in any way.

PROCESSED SCAN DATA

To be delivered in the following formats:

1. Processing software native format (ScanMaster / Realworks / Cyclone / etc.)
2. E57 interchange format (V1.0 E57 file format as approved by the ASTM standard E2807).

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PG Dip Multidisciplinary BIM Project

EIR; Clock Tower Building+New Auditorium Outline of Employers Information Requirements

Client: Grangegorman Development Authority



PAS 1192-2:2013
Incorporating Corrigendum No. 1

Specification for information management for the capital/delivery phase of construction projects using building information modelling

Sheet Contact	From
Sheet Facility	From 2012-01-01
Sheet Floor	From 2012-01-01
Sheet Structure	From 2012-01-01
Sheet Component	From 2012-01-01
Sheet Assembly	From 2012-01-01
Sheet Detail	From 2012-01-01
Sheet From	From

bsi.

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1. Refurbishment of Clock Tower building to be used for administration staff
2. Internal building works to include mechanical lifts, toilet blocks where required, breakout meeting spaces.
3. A New Built auditorium for 300 people to include:

- AV Facilities: PA System with Lapel/Roving Microphone, Huge Screen (wall-mounted), Data Projector (ceiling-mounted), Visualiser to display printed material on screen, Controlled Lighting and Sound, Switch between Multiple Devices, Full Blackout Facilities, Laptop computer, DVD/CD/video Player, Whiteboards, Flipchart
- AV Operation: Direct by Speaker from Lectern, AV Technician in Projection Box, Dedicated Speaker's AV Technician
- Internet: Cabled (Ethernet), Wireless
- Accessibility: Wheelchair Access: Lift on Ground Floor, Audio Loop for Hard-of-Hearing
- Seating: Tiered, Retractable and Flexible, Flat-Floored
- Air Conditioning: Yes
- Water Cooler: Inside Room
- Location: Rear of Clock Tower Building
- Car Parking provision
- Separate access from Clock Tower Building



4. Coffee Shop

- The coffee shop will serve food, drinks and snacks throughout the day. It will be sufficient in floor area to accommodate spill out from the auditorium. This tight comfortable area will be used by the administrative staff during the day and by auditorium attendees when required. The Coffee Shop is located between Auditorium building and the Clock Tower Building.



Team Objectives

1. Develop a BEP using the client supplied EIR
2. Create an MIDP as far as the designated PAS 1192-2 stage 4 process.
3. Select and utilize a CDE for project documentation and digital model hosting
4. Create a team website to capture the teams progressive learning to include:
 - Design sketches
 - Meeting agendas and minutes
 - References and resources
 - Summaries of discussions
 - Meeting video recordings
 - Photographs
5. Create a federated model of the proposed design to include at least an architectural and a building services model.

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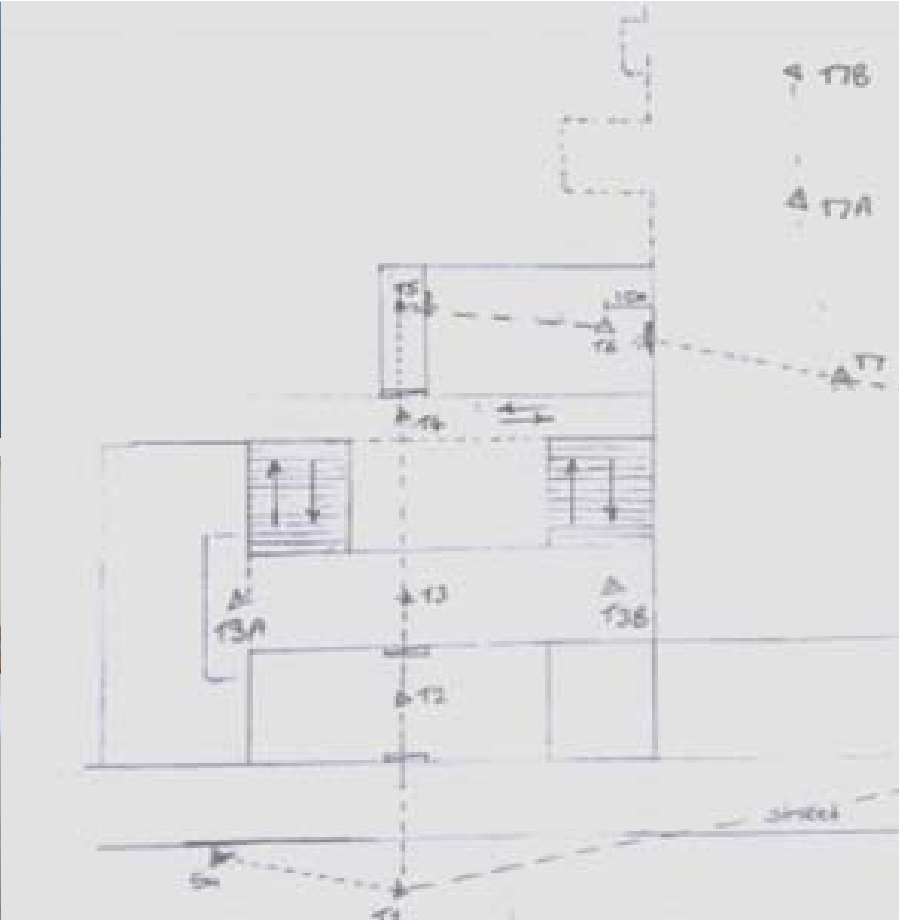


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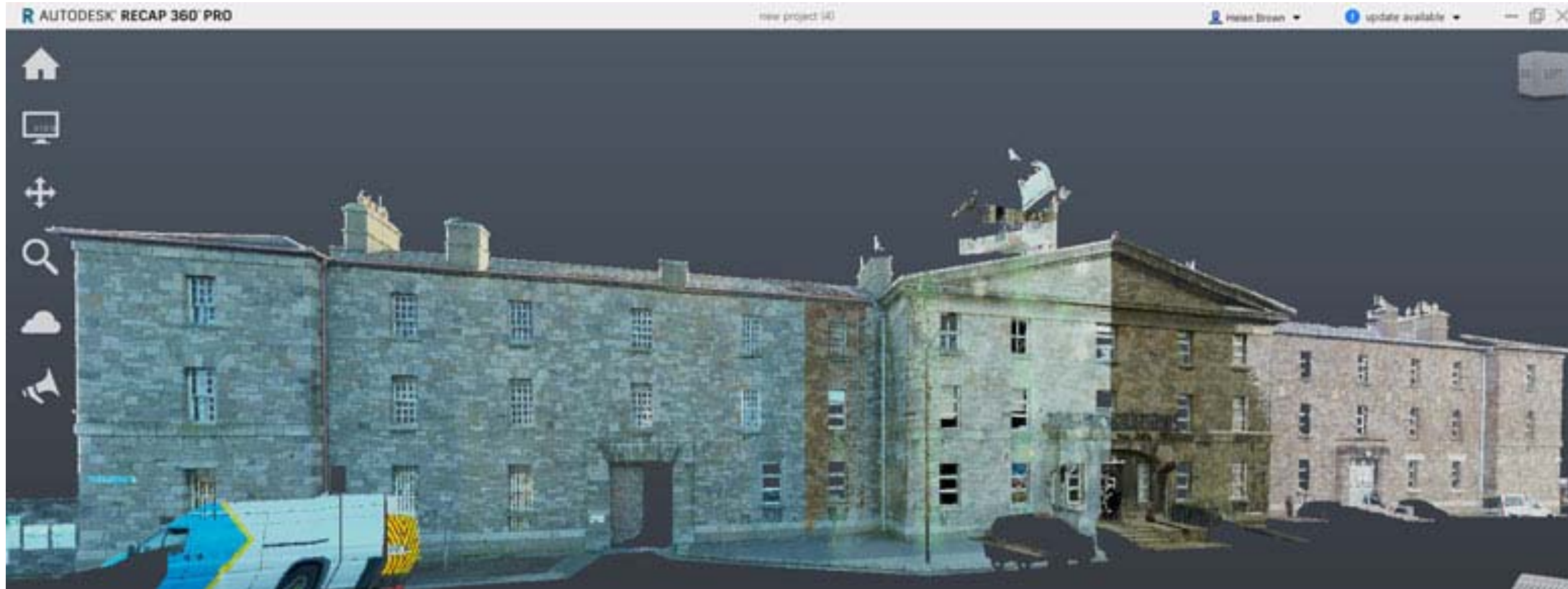
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Grangeorman
Clocktower Survey
January 2017
Sitemap

Grangeorman Clocktower Survey January 2017

Point Cloud Survey was carried out using Topcon GLS2000 (<https://www.topconpositioning.com/mass-data-and-volume-collection/laser-scanners/gls-2000>)

Point clouds have a resolution of 10mm

Processing was carried out with a combination of:

- Topcon Scanmaster
- Autodesk Recap
- Cloud Compare

Cloud Compare is very useful open-source, free software for point cloud manipulation. Included in its capabilities are:

- spatial sampling - if your point cloud is too dense and is causing problems for the usability of data in Revit, this can be used to create lower density clouds
- registration - if you have multiple point clouds, e.g. from handheld devices, Recap 360, terrestrial scanners from different campaigns (such as over time), these can be registered (over lapped) onto each other.

<http://www.danielgm.net/cc/>

Help Wiki: http://www.cloudcompare.org/doc/wiki/index.php?title=Main_Page

YouTube Playlist: <https://www.youtube.com/playlist?list=PLBNUxsUA00UAT63O0d95pByrCitqIXN4>

The global shift applied to the data is:

E -714600

N -735100

H 0

The point cloud should be inserted into Revit using:

Insert - Point Cloud - Origin to Origin

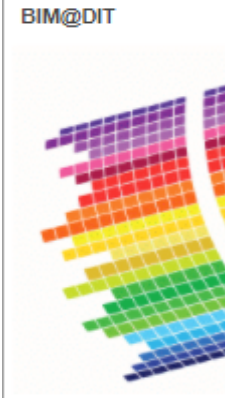
<https://drive.google.com/drive/folders/0B4XBD11KVPyHZzQyNDBN/EZSOUU?usp=sharing>

20170303 UPDATE: I have added a folder called Unshifted_point_cloud_data where I have uploaded the original, unshifted co-ordinates in .e57 format.

This data is in ITM co-ordinates system and was collected by reference to the Murphy Survey original points.

Indoor North Wing shifted	Indoor not colourised
T1 Shifted	High Density photos were taken but Scanmaster failed to apply the colour to the point cloud
T19 Shifted	Exterior central portion of road-facing facade
Photos	Exterior South Wing of road-facing facade
	Exterior - North Wing / Central Portion / South Wing - High Resolution
	Interior - Stairwell * 2 and Room 7 - High Resolution
	Interior - Entrance Porch and Mezzanine Hall - Wide Angle Lens

Software	Function used for
Topcon Scanmaster	Download & registration between setups
Cloud Compare	Global shift to move from ITM to coordinates usable by Revit
Autodesk Recap	Removal of unrequired points and conversion of .e57 files into .rcp -pointer and .rcs - folder - formats for direct use in Autodesk Revit
	For you to do if you wish to assist with modelling
	Division of the point clouds into more manageable subsets using Regions
	Recap Regions



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Run 2 PG MCP Team 6

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Introduction

As part of the development of the campus at Grangegorman and specifically the administration offices housed in the Clock Tower building, proposals have been invited for a new construction comprising an auditorium, coffee room and car park to the rear of the existing structure on the East side of the campus.

The goal of this project is to collaboratively produce a Building Information Model (BIM), sympathetically designed as an addition to the existing protected Clock Tower structure and in conjunction with the clients campus development plan already in place, in the form of an EIR (Employers Information Requirements). The objective of the team is to explore and develop collaborative skills, techniques and strategies that will enhance the professional services that we individually offer in our employment.



Information has been made available to the team in the form of plan and elevation drawings in pdf format, a partial point cloud survey of the existing Clock Tower and a detailed site survey of the current building layout. As a team we will endeavour to work closely together to capitalise on the various levels of experience and capabilities of the team members, coupled with the available data, to fulfill the brief. As individuals, we aim to develop our personal skills in collaboration techniques and the application of BIM protocols to enhance our understanding and comprehension of these areas in our own continuous professional development.





“consideration was given to using the point cloud data to generate the model but due to the time constraints of the project and the time required to produce the model in this way it was decided not proceed with this workflow”



Lessons Learned

- Scale the work to the available time
- The full engagement of Surveyors suggested by Survey4BIM's 'Survey and the Digital Plan of Work' document should be implemented between the two groups of students



- Face-to-face collaboration is needed with online support



Lessons Learned

- Volume Strategy defined for the project, as per PAS 1192:2, which states that a volume is a “manageable spatial subdivision of a project, defined by the project team as a subdivision of the overall project that allows more than one person to work on the project models simultaneously and consistent with the analysis and design process”
- Early involvement of the survey team in the overall project team is essential to maximise the benefit of the volume strategy
- The validation of the model against the tolerances specified by the client is an essential element of the overall utilisation of point clouds



Big5 Geospatial Challenges to Geo Enable BIM Level 2

Survey4BIM



A blurred photograph of a crowd of people in a conference or meeting setting. The people are dressed in business attire, and the background is a bright, out-of-focus interior space. The overall image has a soft, ethereal quality due to the motion blur.

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Thank you

Dr. Avril Behan, Dublin Institute of Technology
Helen Murray, Jonathan Argue, Ronan Hogan, Dr. Audrey Martin, Pat O'Sullivan, Robert Moore, and
Malachy Mathews