

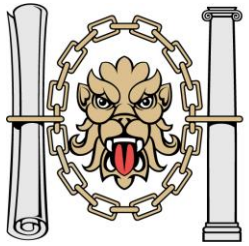
CitA

BIM GATHERING 2019



4th CitA BIM Gathering 26th September 2019, Galway, Ireland.

Delivering **better outcomes**
for Irish Construction



CIAT



The Quality Dimension (qD)

David Comiskey MCIAT, Senior Lecturer at Ulster University

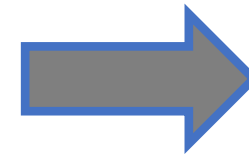
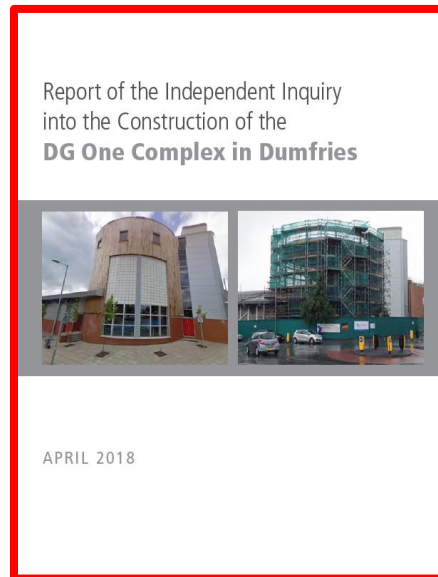
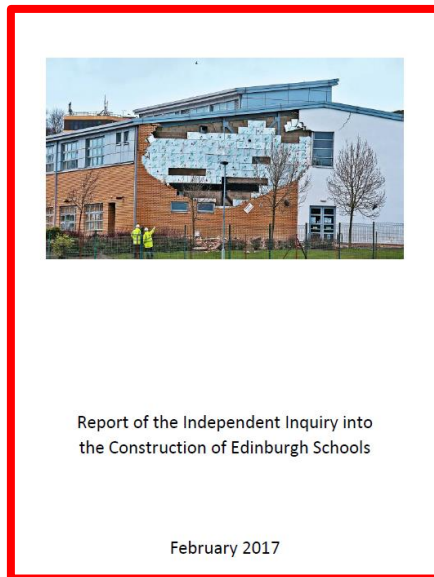
Erin O’Kane ACIAT, Digital Consultant at AECOM

Dr. Trevor Hyde, Reader at Ulster University

Dr. Phillip Millar, Lecturer at Ulster University



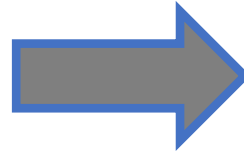
Question: Can digital technologies aligned with BIM processes be applied for the purpose of enhancing construction quality?



**Project
Verify**



Quality – focusing on
design change and
elements **encapsulated**
within the building fabric





Question – Why not simply inspect before covering up?

This is the sensible and desired method of inspection and verification, and will become more common as the Hackitt recommendations are implemented (golden thread). However, it is not always straightforward.



The impact of fraud in construction (which includes material substitution) is in the region of **10%** of overall revenues. With the global industry being valued at approx. \$15 trillion by 2025, this relates to a figure of **\$1.5 trillion**

(Grant Thornton, 2013 citing Global Construction Perspectives/Oxford Economics, 2013).



Image Credit: FutureBelfast, <http://www.futurebelfast.com/property/maldron-hotel/>



Workmanship issues and material degradation/movement over time.

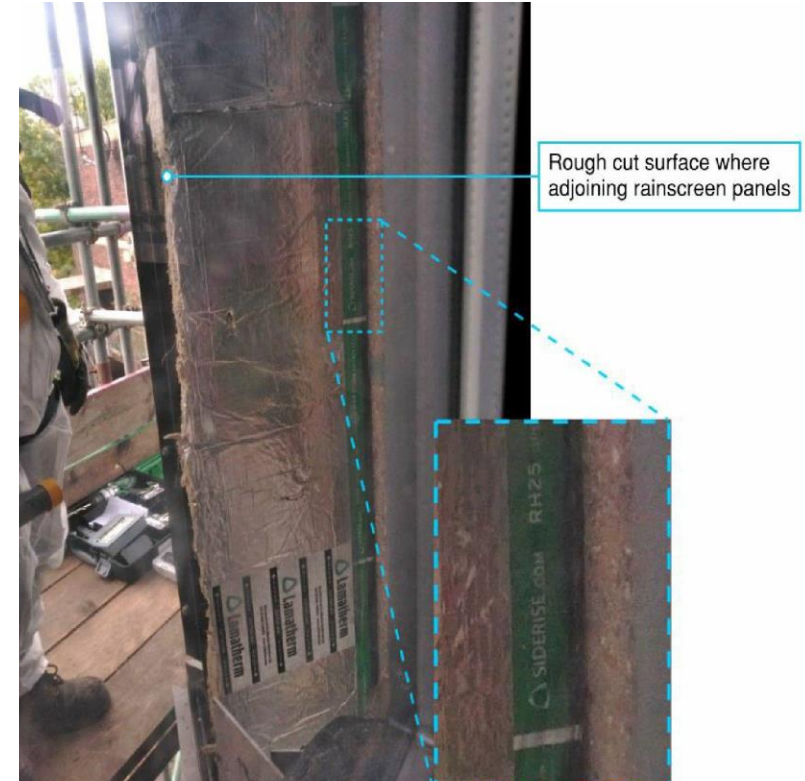
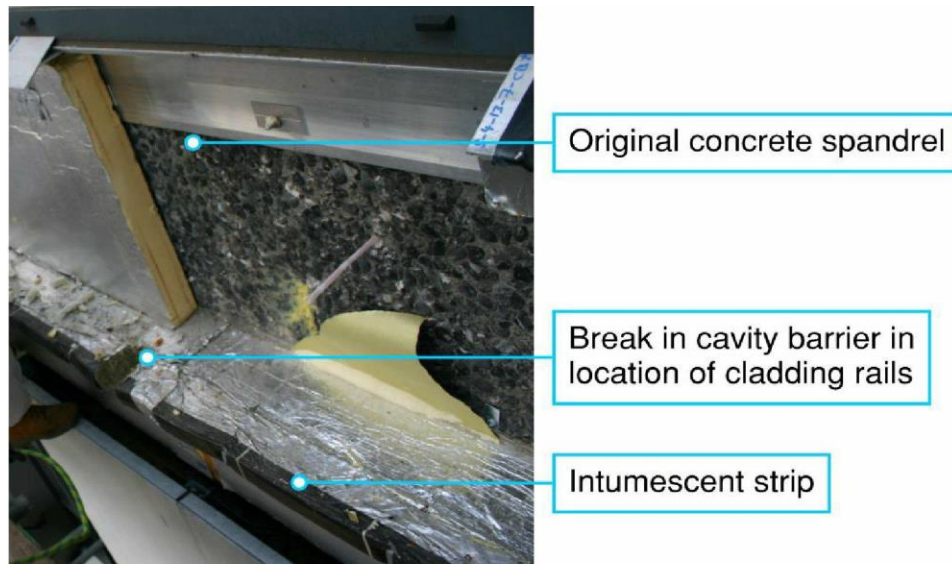


Image Credit: Images taken from Section 8 of Dr. Barbara Lane's Report (Grenfell)

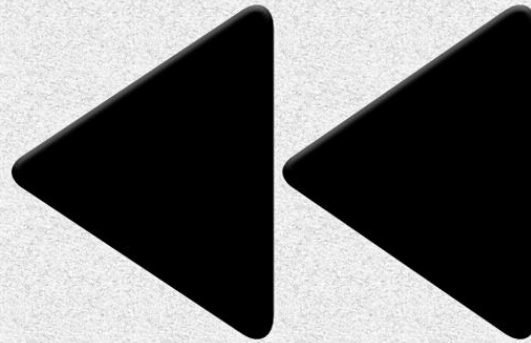


Definition of precise digitized regulation clauses.	In order to be digitizable regulations must be available for analysis and rewriting so as to reduce the need for interpretation.	4	-Engagement of policy makers and implementors.	-Lack of engagement from policy setters and implementors. -Legal issues with owners of regulations	All	-Methodology and supporting tools to support drafting of digitizable regulations. -Methodology and supporting tools to allow digitisation of human readable regulations.
Continuous checking the quality of assets using calibrated instrumentation along with other data sources	Provides the ability to determine if physical assets comply with regulations/requirements throughout their lifecycle, without the need for extensive human inspection.	4	-Data collection technologies i.e. photogrammetry, LIDAR scanning, IoT devices - Widespread deployment of these technologies -Automated analysis of data collection and comparison to virtual model of assets and regulations/requirements.	-Collection and robustness of data collection technology. -Lack of confidence in technology solutions -Resistance to change	All - specifically construction and in-use stages of asset lifecycle.	-Studying applicability and selecting appropriate data collection technologies -Developing ability to automatically process collected data and performed





Rewind





Aim: *Better understand the inadequacies relating to build quality and the potential for digital technologies to assist*

Methodology: *Online survey and focus group.*

Chartered Architectural Technologists on the CIAT Register of Practices (circa 1405) with a 10% approx. response rate and Chartered Members in international regions (circa 310) with 10% approx. response rate.

UK based focus group supplemented with data from three Canadian focus groups to provide an international dimension.



Deviation between what is designed and detailed at the technical design stage and what is constructed on-site (performance gap)

Prevalent or Extremely Prevalent **79.6%** (ROP) & **78.1%** (Int)

Experience of work being covered up or progressed to a stage whereby some details are unable to be fully viewed or inspected?

Yes **87.7%** (ROP) & **90.3%** (International)

*For those answer Yes, **78.3%** (ROP) and **65.5%** (Int) stated this as being either prevalent or extremely prevalent*



Overwhelming majority would welcome a technological solution to assist with inspection and verification of in-situ constructed details.

Poor on-site practice, especially in relation to detailing, was seen as contributing to and having a negative impact on building performance especially in relation to fire safety and energy performance.

Do you believe that current regulatory inspection processes , in the country in which you undertake the majority of your work, are adequate for in-situ verification of what has been built, especially in relation to building details?

No **67.6%** & Unsure **13.8%** (ROP) and No **63.6%** & Unsure **15.2%** (Int)



Universal acceptance of issues with construction quality.

Recognition of the potential afforded by digital technologies in relation to data capture and verification

In terms of the as-built record...do you think it is important that exact materials used in the construction are recorded i.e. specific insulation type, type of cavity closers etc.

Yes **91.1%** (ROP) & Yes **90.6%** (Int)



Do you see digital technologies assisting in producing an accurate as-built record in addition to current BIM processes?

Yes **62.8%** & Unsure **27.6%** (ROP) and Yes **75.8%** & Unsure **15.2%** (Int) and

Do you think BIM and wider digital technologies could potentially assist in the verification of building details, easing the reliance on surveyors and certifiers?

Yes **48.6%** & Unsure **27.8%** (ROP) and Yes **68.8%** & Unsure **9.4%** (Int)



Focus Group – **F**ailure **M**ode & **E**ffect **A**alysis

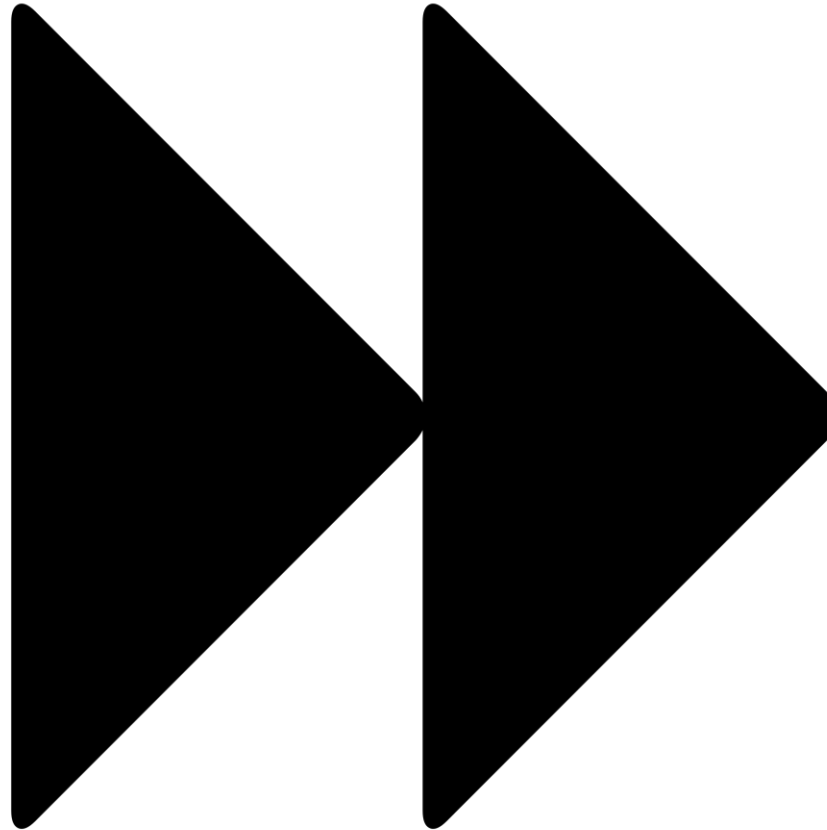
Vignette Technique used to visually represent common construction defects with each evaluated in turn

A numeric value is placed against the likelihood of occurrence on site (using current inspection practices) and the severity if it did occur. This figures were multiplied to give an overall value which could then be classified into **Low, Moderate, High** and **Unacceptable** risk categories.

The aim was to create a benchmark for common construction defects against which technological solutions could be evaluated.



	UK Study	Canada 1	Canada 2	Canada 3
Material Substitution (fire stopping)	High	Low	Low	Unacceptable
Material Substitution (insulation)	High	Low	Low	Moderate
Material Substitution (cladding)	Moderate	Moderate	Low	Low
Gap between cavity barriers	Unacceptable	High	Unacceptable	Unacceptable
Gap between insulation materials	High	Moderate	Low	Unacceptable
Incorrect dimensional gap between rear of cladding and fire barrier	High	High	Low	Low
Missing Components	Unacceptable	Moderate	Low	Unacceptable
Damaged Components	High	Moderate	Low	Low







Thank you