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"Geospatial Information for a Smarter Life and Environmental Resilience"
5-DIMENSIONAL BIM AND THE CHALLENGES OF ADOPTING MEASUREMENT STANDARDS

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PRESENTATION OUTLINE

- Traditional Quantity Surveying
- BIM – Based Approach
- Classification Systems
- BESMM4 and the Challenges of Automation
- Conclusion
TRADITIONAL QUANTITY SURVEYING PRACTICE

1. Quantity Take-off (QTO) is generally performed manually or the use of software packages for QTO from 2D or 3D CAD drawings.

2. Using software applications QS still have to manually extract useful information from printed drawing set or CAD drawings.

3. Transferring dimensions to sheets or spread sheets AND carrying out cost estimates or interim payment assessment.
ISSUES WITH TRADITIONAL PRACTICES

- Focus on drawing production
- Projects information in multiple files and format
- Difficult to manage changes late in the design
- Design intent and cost data are often separated and isolated in different digital environments
- Risk of data loss during multidiscipline coordination
- The practice is time consuming, inefficient & susceptible to human errors.
BIM EVOLUTION AND MEASUREMENT STANDARDS

- BIM holds great promise for addressing these challenges by using automated BIM QTO tools.
- BIM-based QTO provides simpler and yet more detailed and accurate cost estimates of the project.
- Information is usually exchanged between the BIM and cost estimation software in one of two ways:
  - Both systems use the same proprietary format for product data definition and the exchange is done smoothly without loss of data.
  - The systems use different proprietary formats and the exchange is done by converting the data to a third, common format, usually the Industry Foundation Classes (IFC).
- HOWEVER, the rules of measurement would be required to provide the basis for codified framework for cost planning (Matipa, Cunningham, & Naik, 2010).
IFC is an industry-wide open and neutral data exchange format that will interact with the majority of measurement software.

Project information and specifications need to be organized in a structured format to ensure interoperability and processes such as cost planning to take place.

Designers do not always design in a way that easily aligns to measurement standards.

Popular BIM tools cannot manipulate data in line with the rules of measurement standards.

Hence, the need for a system to classify construction information
CONSTRUCTION INFORMATION CLASSIFICATION SYSTEMS (CICS)

- CICS is defined as a standard representation of construction project information (Carlos and Soiberman, 2003).

- The classification structure in CICS provides a common framework for improving organisation and coordination of information in construction projects.
## CONSTRUCTION INFORMATION CLASSIFICATION SYSTEMS

<table>
<thead>
<tr>
<th>S/No.</th>
<th>CLASSIFICATION SYSTEMS</th>
<th>COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MASTERFORMAT and UNIFORMFORMAT (NOW IN OMNICLASS CONSTRUCTION CLASSIFICATION SYSTEMS- OMCCS)</td>
<td>US &amp; CANADA</td>
</tr>
<tr>
<td>2</td>
<td>COMMON ARRANGEMENT OF WORK SECTIONS (CAWS) UNIFIED CLASSIFICATION FOR THE CONSTRUCTION INDUSTRY (UNICLASS, 2,15)</td>
<td>UK</td>
</tr>
<tr>
<td>3</td>
<td>NATSPEC CLASSIFICATION SYSTEMS</td>
<td>AUSTRALIA</td>
</tr>
<tr>
<td>4</td>
<td>CODE OF PRACTICE FOR CLASSIFICATION OF CONSTRUCTION COST INFORMATION &amp; CODE OF PRACTICE FOR CLASSIFICATION OF CONSTRUCTION RESOURCES INFORMATION</td>
<td>SINGAPORE</td>
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</table>
Singapore's Code of Practice for Classification of Construction Cost Information (SS CP80 : 1999)
Comprises of:
- an elemental classification
- a work-section classification
- a mapping dictionary for elements and work sections
- a set of guidance notes
Aligned with Construction Electronic Measurement Standard adaptable for model quantity extraction in BIM

<table>
<thead>
<tr>
<th>United Kingdom</th>
<th>Common Arrangement of Work Sections (CASWS) and Unified Information Classification Systems (Uniclass).</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMM7</td>
<td>• CAWS – work section classification format</td>
</tr>
<tr>
<td></td>
<td>• Uniclass – Section J contain CAWS and Section G. Building Elements</td>
</tr>
<tr>
<td></td>
<td>SMM7 is aligned with CAWS</td>
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</tbody>
</table>

Australia
ASMM5
National Specification Systems of Australia (NATSPEC).
Australian Standard Method of Measurement of Building Works (ASMM5)
In the US: Construction Specifications Institute (CSI) and Construction Specifications Canada (CSC) developed:

- Masterformat for work results &
- Uniformat for Elements.

OmniClass was developed by the International Construction Information Society (ICIS) & incorporates both Masterformat & Uniformat: -ISO 2006-2
In the UK:

- The development of **CAWS** was based on the outcome of the work of Co – ordinating Committee for Project Information (CCPI) (Seeley, 1989) Now **CPIC** Construction Project Information Committee
- The **CPIC** was sponsored by the:
  - Royal Institute of British Architects (RIBA);
  - the Royal Institution of Chartered Surveyors (RICS),
  - the Construction Confederation (CC),
  - the Institution of Civil Engineers (ICE),
  - the Chartered Institution of Building Services Engineers (CIBSE) and
  - The Chartered Institute of Architectural Technologists (CIAT) (Gelder, 2010)
In Singapore: Construction Industry IT Standards Technical Committee (CITC) & the Construction and Real Estate Network (CORENET) Developed the following Standards:

- Code of Practice for Construction Computer – Aided
- Code of Practice for Construction Electronic Measurement Standards (CEMS)
- Code of practice for Information Exchange and Documentation.
In Australia:

- Australian NATSPEC was developed and published by the Construction Information Systems Australia (CISA) in 1975, last update was 2007;
- Arranged around work sections
- NASPEC also covers tendering procedures, preliminaries, quality assurance and contract issues.
- Basis for AUS-Spec &
- Basis for the 5th Edition of their SMM (ASMM5)
IFC export shows only Object based Quantities

Extracting quantities according to the Standard Method of Measurement of Building Works requires Information Delivery Manual

Maintaining Object based quantities with standard based quantities in BIM requires software vendors.

There is no holistic solution from software vendors

Standard is required to define QS traditional practices
A review of BESMM3 (UK SMM7 & CESMM3)
Structure & term of set-out based on UK NRM2, SMM7 and CESMM4;
prepared by NIQS without consultation with other professionals;
Only document that mimicked UK classification system; but
Not aligned with any local classification system;
Therefore cannot support model-based quantity take-off on collaborative basis;
<table>
<thead>
<tr>
<th>Organisation Type</th>
<th>Interviews Conducted</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contracting</td>
<td>8</td>
<td>30%</td>
</tr>
<tr>
<td>Client</td>
<td>7</td>
<td>26%</td>
</tr>
<tr>
<td>Consulting</td>
<td>12</td>
<td>44%</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>100</td>
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</table>
Findings from the study shows that:

- 79% of the participants believed there is no classification systems in the construction industry;
- 20% have no knowledge of the use of classifications systems;
- 45% pointed out that there is no relationship in the measurement standard used and industry classification systems; and
- 10% of the participants stated that they have organisation-based classification system used for BIM projects.
RESULTS: CHALLENGES OF USING BESMM4 IN 5D BIM

- No specification standards jointly referenced by design professionals in the country;
- Designer firms largely extract specifications from manufacturer’s catalogue for integration into their design-lack of specification standards;
- Individual design firms made reference to specification documents built-up over years of practice.
CONCLUSION

- The study discussed traditional QS practice and BIM evolution.
- The nature of the construction industry classification systems used in some selected countries were identified and the relationships between their measurement standards highlighted.
- The study found that there is lack of common classification system used by industry practitioners that could serve as basis for aligning measurement standards.
- The study also found that QS could champion the course of developing classification systems by way of collaboration with other industry stakeholders. Such standards could in turn be aligned with measurement standard used by Quantity Surveyors.
IMPLICATION OF THE STUDY

- Extracting quantities in 5D BIM requires standards to define QS traditional practices and the standard must align with CICS.

- Such Standard must align with the requirements of BIM authoring software for efficient quantity extraction.

- In the interim, measurement and quantification may need to continue using 2D and 3D drawings at industry level.
Collective championing effort among industry players is required to develop construction information classification systems and specification standards for the benefit of the entire industry stakeholders.
THANK YOU FOR YOUR KIND ATTENTION