

## Quantity Take-Off (QTO) Tool

### Case study at a glance

This BIP and Construction Workshop case study investigates the use of a BIM-integrated QS tool to measure deltas in project control quantities and cost rates.

#### **Project**

Recreation Centre, University of Canterbury

#### **Project phase**

Design

#### **Problem/Opportunity**

The Quantity Surveyor (QS) typically undertakes a full measure of the project building elements once in each design phase (feasibility, concept, preliminary, developed, detailed). Often designs come in over budget which then leads to a reactive project delivery approach to mitigate budget overruns. This causes programme delays and additional design costs when the project is forced into a value engineering phase.

#### **Potential benefits**

Use BIM quantification to provide faster and more accurate cost information resulting in design efficiencies. The QS can also use the results to compare against their control quantities and cost rates.



## Context

A QS can take considerable time to measure projects as identifying, understanding and measuring changes from previously issued documents is a time-consuming process.

A possible solution is to use the design team's shared 'work in progress BIM models' with a quantity take off (QTO) tool to provide nearly 'live' project element data with which the QS can use this data to update the project team on cost status.

Knowing that the models will develop week by week and more BIM elemental content gets input into the 3D space, is it possible to get this information easily, quickly and in a format that is useful?

## What issue is this tackling?

The Quantity Surveyor (QS) typically undertakes a full measure of the project building elements once per design phase (feasibility, concept, preliminary, developed, detailed). Often designs come in over budget which then leads to a reactive project delivery approach in trying to mitigate budget overruns. This causes programme delays and additional design costs when the project is forced into a value engineering phase.

## Opportunity

To use a software tool that calculates and tabulates the delta of quantifiable attributes (count, length, area and volume) from two iterations of a federated model. This provides a warning system for the design team, in the event that control quantities have been exceeded.



## BIM Data Extraction Solutions

Two methods were tried for extracting the BIM data with both methods publishing the information into a web-based tool (Microsoft Power BI).

### Method 1 - Revit plugin (Ideate – BIMlink)

An “off the shelf” plugin was used to extract the data into an excel file and copy/paste into a structured excel workbook. The results were then linked to Power BI.

#### Pros

This method was the proof that it could be done and subjectively faster and more accurate than the conventional process.

#### Cons

The process was still quite time consuming as it required double handling of the data through a Revit technician undertaking the first extraction, delivered via one excel sheet, subsequently additional translation and further information to the data (e.g. date) was applied by another team member. From there, the Power BI was updated. After seven model updates, the excel file became cumbersome.

### Method 2 - SQL database tool

Use a secure structured SQL database tool linked to Revit and directly link results into Power BI.

This required more upfront work for setup as the company SQL database tool was adapted for this task. However once programmed the tool enabled a snapshot to be created directly from the model and the Power BI is updated with a change in the parameter data field.

The QS is now using the shared BIM ‘work in progress’ data to compare against their cost plan and report cost risk back through the project team channels.

Training in the use of the web-based Power BI tool was provided to the QS.

#### Pros

- Raw Revit data exported as quantifiable items is possible and is presented in a meaningful way.
- Simple access to a web-based table results environment.
- A track history can be produced mapping object placement over time.
- Low cost/time to deliver results vs traditional approach using QS tools.



## Cons

- New concept of delivering QS work, and bringing the QS on the journey was slow at the start. One value engineering (VE) round was not avoided as the uptake of the tool was slow;
- Completely reliant on the design team's approach to modelling design Eg: naming of objects, design options function, lag in 'sketch to model' process.
- Tool required users to have a deeper understanding of model content.
- Current QS fee structures are not built around this alternative delivery method.

## Benefits

The intended benefit of this tool is to achieve efficient 'non-milestone' BIM quantification to assist the QS in tracking design evolution. The QS can then use the results to compare against their control quantities and cost rates.

These results enable the project team to check in with the control quantities associated with their discipline. This can aid early warning or interventions based on material/item project affordability and whether or not the control quantities are set correctly with the project design/use parameters.

## User Experience

The tool delivers the concept it was produced to meet and was trialled by the project QS. However, the key challenge ahead lies in full project team adoption of the tool and leveraging the data to drive certainty through the final design phase.

The QTO tool using Method 2 has potential benefit to projects of all kinds as it eliminated the human transfer element. It meant that the model could be loaded autonomously. Whilst there was no difference in accuracy, the process as a whole was more robust and stable. Cost and budget check-ins at more frequent intervals are possible using data extracted from BIM models.

## With Thanks

BIP and Construction Workshop would like to thank the key collaborators involved in participating and delivering this case study:

**RAWLINSONS**

**RCP** 

## Background to the Building Innovation Partnership (BIP)

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