demonstration project

PalaceXchange

Project Name:	PalaceXchange
Project Location:	Middlesex
Sector:	Commercial
Themes:	Building Information Modelling
Project Team:	ING Real Estate / Costain / Reid Architecture / Gifford
Contract Value:	£30m
Type of Work:	Retail development

The PalaceXchange scheme involved the erection of a civic building comprising three-storey civic/library accommodation. This was connected by a new footbridge to a 530-space multi storey car park below including three leisure use compartments. It provided 14,000m² of new retail space in 22 shop units and 6,038m² of leisure and cultural venues and a link between the town's top high street retailers.

Drivers for Change

Costain wished to improve their processes to deliver a high quality end product with less waste in the design process. The clients, ING Real Estate, were keen to make good use of technologies and techniques to make the construction process more efficient and reduce the operational costs. The client and contractor felt that a Building Information Model (BIM) could help to improve spatial coordination and produce better quality information with a reduction in Requests for Information (RFI). The team therefore decided to use a basic BIM in the form of a 3D model, initially to check the spatial coordination between the architecture, structural frame and facade. This was then passed to the timber cladding specialist.

Enablers

Costain decided to review existing documentation to assess the extent to which a consistent approach had been taken, and standard format used, during the development of the design documentation. This was carried out by a third party consultancy, TruAxis and an audit report was produced. Costain's main concern with the findings of the audit report was the lack of standards in use as they found that the drawings were to different scales and to different origins.

The early audits undertaken by TruAxis found some inconsistency in the spatial co-ordination of the design. The Avanti team was asked to investigate the inconsistencies to confirm whether they could be resolved through the agreed standards. Avanti is an approach to collaborative working that enables construction project partners to work together effectively. It works on the following principles:

- Early access to all project information by all projects
- Early involvement of the supply chain
- Sharing of information, drawings and schedules in an agreed and consistent manner.

They found that the issue primarily resulted from inaccuracies in dimensions which were added to drawings during their development. The generic Avanti approach advocates the usage of 'associative dimensioning' (where the CAD technology in use allows) whereby the dimensions are added to drawings automatically by the CAD system when the base reference files are updated. This removes any risk of error in dimensions where they are added as text by the operator.

Following the review, a series of simple common formats were defined, and fully agreed by representatives of all project partners, for catagorisation of design data, data and document exchange formats, the drawing template and the CAD layer naming convention.

Once the project standards were agreed, meetings were held to present the methodology to the sub-contractors that had design and co-ordination responsibility when they were appointed and once their buy-in had been achieved.

TruAxis developed a 3D model and the steel suppliers, Bourne Steel, were already familiar with the technology. Costain recognised that by employing the external TruAxis team to undertake 3D modeling they were paying for an external organisation to check one of the lead designers' responsibilities, namely design coordination, but they were content as this process was speeding up the overall design and co-ordination process. The rest of the team had little prior experience of using BIM and so experience was not stipulated as a requirement during the procurement of the supply chain. As is often the case where new ways of working are proposed, there was some reluctance amongst the team to try out the BIM and Avanti approaches. However workshops had been held to explain the benefits and once this had been understood the tools aided the cultural integration of the team.

Barriers

Collaborative working using the Avanti approach is best implemented at the earliest possible stage in the design process. When the decision was taken to

use the Avanti approach on the PalaceXchange project the design process was well underway. This meant that implementation of the entire Avanti approach was not possible.

Lessons Learnt

The Avanti consultant, and Costain identified the following learning points:

- Costain and their partners have a culture of improvement and this facilitated the introduction of the Avanti approach.
- The investment needed can be greater where the new approach is implemented once design has been produced, as existing designs needs to be checked and redrawn
- Successful implementation of the Avanti approach can be achieved where organisations have:
    - A management team with the willingness to promote and enable the change
    - People with skills which are commensurate with the approach and the scale of the change required, or can upgrade their skills as required
    - Well-prepared and formalised processes and procedures so that consistency of approach can be achieved without ambiguity
    - Technologies, where required, which enables the approach to be implemented.
- Costain are implementing the Avanti approach, on other projects, in a considered, phased manner. This continuous improvement approach, on a project-by-project basis meant that resistance to change could be managed more easily than where step changes in practice are adopted.
- The design team members developed design in 2-D as the norm, however this did not prevent the adoption of collaborative methods and 3D modeling provided additional benefits.
- It is much easier to encourage sub-contractors to adopt processes and standards where these are agreed at the time of their appointment. This means that the collaborative approach is applied from the outset rather than making a transition between approaches halfway through the project.

KPI Results

Information management processes were seen to be greatly enhanced. For example, in one area of the design a saving of two hours per drawing was achieved in formatting and preparing the drawing for issue. This area of the building was represented on 65 drawings each of which was expected to be issued 6 times for different purposes giving a total saving of nearly 800 man-hours (or £50K). Savings of up to 50% compared to traditional methods in the effort required in the exchange of information documentation were observed thus negating the initial investment.

Changes required to the facade design to satisfy Planning Conditions meant that a set of 1:5 details had to be produced. The architect was able to re-use design produced by the façade contractor, Solaglas. The architect stated: "the preparation of 1:5 drawings involved a lot less guesswork than usual as we could access [and re-use] the Solaglas model files. This meant we could issue fully co-ordinated information." Sharing of information in this way is one of the key advantages of employing approaches such as Avanti and BIM.

The approach meant that the formal activity of design co-ordination coordination phase and clash detection happened inherently when all parties are reusing each others' CAD information – all at the same origin, orientation scale, as reference files.

Similarly, reviewing others' information for approval was much simpler as it was fully spatially coordinated and achieved a much higher quality and level of spatial co-ordination. The architect calculated that the process for repositioning every other party's existing details for review and coordination check as below:

45-50 details per area
x 15-20 minutes per drawing
x 4 areas for that building
x between 3 and 6 levels on each building
= approx 8 man-weeks per building

This shows that where the Avanti approach is adopted, a huge quality improvement can be attained in return for little or no investment in cost or time.

One of the interesting observations was the impact that consistent information can have on cost certainty. Where information which was compliant with the Avanti SMP was issued for tender the spread in tender returns (variance in costs as % of total package value) was smaller than where returns had been received previously. Costain suggested that this is due to a consistency in the interpretation of information enabled by the issue of better quality information.

Costain recognised that co-ordinated information generated using the Avanti approach was helping to flush out hidden design costs that otherwise may have developed into claims at a later stage where is would be more difficult to resolve.

The project was measured against requests for information and design changes and was fully reported in the Avanti documentation. Further measurements were carried out by Costain suggest that overall the project saved around 10% of the construction cost (around £3.6m). The final building is considered to be fit for purpose.

Conclusions

The experience of Avanti to date, and findings from impact analyses, has been sufficient for Costain and Reid Architecture to express commitment to the implementation of the Avanti approach on this and other projects. They felt that the major benefit of improved spatial coordination was the delivery of the project 10% under budget. Some members of the team have adopted the Avanti principles and have used 3D modeling in subsequent projects. Costain is now considering the priorities among their other projects to adopt the approach. Likewise the team at Reid Architecture is committed to adoption of the Avanti approach and is also now prioritizing its projects

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