The Avanti team works with Costain at PalaceXchange to deliver a better product with less waste in the design process

Why Avanti?

Costain wished to work in a better way to deliver a high quality end product with less waste in the design process, and their client, ING Real Estate, were keen to make good use of technologies and techniques to make the construction process more efficient and to reduce the cost of operating their development.

However the PalaceXchange project brought a significant challenge when Costain first approached the team behind the Avanti approach for support, because a good deal of design had already been produced.

First steps

The goals associated with the introduction of the Avanti approach on the project were agreed with the principal team members at Costain. A decision was made early on in the involvement of the Avanti team that since a lot of design had already been undertaken – design concepts had developed over a period of two years – a wholesale conversion of existing processes to the Avanti approach was unachievable. However, to establish what was required Costain decided to review existing documentation to see to what extent a consistent approach had been taken, and standard format used, during the development of the design documentation to date. A third party consultancy, TruAxis, carried out this work, alongside 3-D modelling work which they were appointed to undertake, and an audit report was produced.

Costain's main concern with the findings of the audit report was the lack of standards in use – the drawings were to different scales and to different origins – and, more importantly, the lack of spatial co-ordination which would be the obvious result.

Project achievements

Following the review, a series of simple common formats were defined, and fully agreed by representatives of all project partners, for the following:

- The origin for design information was to be based on a local project survey.
- Reference levels at the ground floor of the buildings were agreed.
- Orientation of the scheme, from the origin, was agreed.
- Specification for the use of building grids was agreed.

PalaceXchange is a £30M prestige retail development located within the heart of Enfield in Middlesex.

PalaceXchange is located directly between, and links together, the town's top stores (Mark's & Spencer, Pearsons Department Store and Woolworths). It will provide 14,000 sq m (150,696 sq ft) of new retail space in 22 shop units and 6,038 sq m (65,000 sq ft) of leisure and cultural venues.

The scheme involves the erection of a civic building comprising three-storey civic/library accommodation. This is connected by a new footbridge to a 530-space multi storey car park with three leisure use compartments below.

The client is ING Real Estate
Architect: Reid Architecture
Structural Engineer: Gifford

- It was agreed that design data should be categorised in accordance with the CI/SfB system, however the architects were using aliases associated with that system and so conversions (using 'look-up tables' layer conversion capability) were necessary when information was being exchanged between architect and engineers, who were using Microstation and AutoDesk2005 respectively.
- It was agreed that the data exchange format would be compliant with Autodesk2005 'DWG' file format. The originator had the responsibility to check the AutoCAD2005 conversion to ensure that it was fully representative of the original Microstation file before sharing on the project extranet.
- The 'DWF' document exchange format was agreed.
- A drawing template supplied by Costain was agreed as the standard for use in all future drawing publication.
- It was agreed to use a CAD layer naming convention in accordance with the mandatory fields defined in BS1192 part 5 plus an alias – exactly as the generic Avanti 'Standard Method and Protocol' document – see www.avanti-construction.org.
- The iCosNet project extranet, as supplied by Costain, was to be used.

The agreed methods were described to the project design managers, and subsequently to the CAD users. After some initial resistance the methods were accepted and subsequently published for use by the team.

As described above, the early audits undertaken by TruAxis found some inconsistency in the spatial co-ordination of the design. The Avanti team was asked to investigate why this was the case and to confirm whether there were any reasons which may not be resolved through the agreed standards. A significant part of the issue resulted from inaccuracies, albeit minor ones, in dimensions being 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. This removes any risk of error in dimensions where they are added as text by the operator.

Since the agreement of the project standards, meetings have been held where the methodology has been presented to sub-contractors with design and co-ordination responsibility as they are appointed and their buy-in has been achieved.

Learning points

The following observations and learning points have been made by the Avanti team, TruAxis, and/or by Costain themselves:

- Costain and their partners have a real culture of improvement and this has facilitated the introduction of the Avanti approach relatively easily. 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 being adopted and the scale of the change required, or who are in a position to upgrade their skills as required;
  - Well-prepared and formalised processes and procedures so that consistency of approach is achieved without ambiguity; and
  - Technologies, where required, to enable the approach to be implemented.
- Costain is implementing the Avanti approach in a considered, phased manner. The experience to date suggests that this continuous improvement approach, on a project-by-project basis, allows resistance

to change to be managed more easily than where step changes in practice are adopted.

- The design team members develop design in 2-D as the norm, but this has not frustrated the adoption of collaborative methods – a fact which backs up one of the principles of the Avanti approach, namely that, whilst 3-D modelling provides additional benefit, collaborative processes can have an impact where design is developed in 2-D.
- It is much easier to encourage sub-contractors to adopt processes and standards where these are agreed at the time of their appointment. In fact, evidence from this and other projects suggests that this is true of consultants and sub-contractors, not because of any terms in the appointment but because it means the collaborative approach is adopted from the outset and a transition from one approach to an alternative is not required.
- Costain recognise that by employing the external TruAxis team to undertake 3-D modelling they are paying for an external organisation to check one of the lead designers' responsibilities, namely design co-ordination, but they have confirmed that this process was speeding up the overall design and co-ordination process.
- One of the benefits on this project, which was not expected and is related to the character of the project, is the opportunities the client sales / leasing team have: tenant requirements can be reflected in a co-ordinated design model quickly showing whether changes are achievable, and the impact of those changes.

Bottom line (so far)

The effect of adopting elements of the Avanti approach to collaborative working has been assessed in two ways. Firstly, since Costain has an external consultant engaged in a position to check co-ordination of 2-D design as it is issued, they are capable of spotting where clashes result from a failure to comply with the new processes and standards. These failures trigger RFIs, each of which can be analysed by the project Quantity Surveyors to establish the result of non-compliance with the new processes and standards. Secondly, the Avanti team have commissioned an independent consultant to investigate the investment made in adoption of the Avanti approach and the benefits accruing from it, when compared to the practices which are commonplace within the team members' organisations. The findings established are described below.

The Avanti team recognises that the adoption of a new method of working requires an investment in time to be made (and cost, where new technology is required). Feedback from this and other projects suggests that this investment is greater where the new approach is implemented once design has already been produced, since that design needs to be reformatted, which is the case on this project. Therefore, it is perhaps not surprising that a significant investment was required by the team: the architects were required to restructure drawings to comply with the Avanti Standard Method & Protocol (SMP) at a cost of approximately £60K (4 people, full-time for 6 weeks = 24 man-weeks).

However, information management processes were seen to be greatly enhanced by the adoption of the Avanti approach. For example, in one area of the design a saving of 2 hours per drawing was seen in formatting and preparing the drawing for issue. Whilst this may not seem significant 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). It can be seen that just in the area of preparing documents for issue such a saving can be made that the total investment cost has nearly been paid back.

With regard to the actual exchange of information and documentation through the project extranet, savings of up to 50% in the effort required were observed compared to traditional methods. Subsequent re-use of information was analysed in focused aspects of the project. One of those aspects was in façade design where changes required to satisfy Planning Conditions meant that a set of 1:5 details had to be produced. The architect could 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."

A fundamental aspect of the formal activity of design co-ordination involves doing extensive dimensional checks to ensure that all information is dimensionally consistent and 'fits together' without clashes – something typically done by referring to multiple drawings once they have been printed. With the adoption of the Avanti approach it is evident that the formal co-ordination phase happens inherently when all parties are reusing each others' CAD information – all at the same origin, orientation scale. Similarly, the method of reviewing others' information for approval is much simpler as a visual check will easily identify any significant error – as it is fully spatially co-ordinated. As a result the overall approvals process involves significantly less effort to achieve a much higher quality and level of spatial co-ordination. The architect considered the effort required to reposition/make ready for review every other party's existing details so that they could perform a simple co-ordination check as described here:

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 was felt to be so much work that it would not be feasible to undertake the work and achieve the desired time saving on this project. However it does show 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 made concerned the impact consistent information has on cost certainty. It was noted that 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 based on pre-Avanti information. Costain has suggested that this is due to a consistency in the interpretation of information, which is enabled by the issue of better quality information.

In a similar vein, where packages, such as steelwork, were being tendered whilst the Avanti approach was being adopted, new information was being generated and issued to sub-contractors which lead to requests for additional fees from the sub-contractors. Whilst this could be interpreted as addition of cost, 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 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. 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 prioritising its projects.

About Avanti

Avanti is an approach to collaborative working on projects that enables construction partners to work together effectively. The principles of collaborative working the Avanti way are early access to all project information by all partners, early involvement of the supply chain, and sharing of project information, drawings and schedules, in an agreed and consistent manner. The Avanti approach is supported by handbooks, toolkits and on-site mentoring.

Avanti focuses on people and processes, mobilising existing enabling technologies. Team working and access to a common information model are at the heart of the Avanti approach to a project's whole life cycle.

Using the Avanti approach improves business performance by increasing quality of information and predictability of outcomes and by reducing risk and waste.

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