

**CITB-ConstructionSkills action
learning project – supply chain
integration, logistics and e-trading**

**Report into the application of a
logistics management system to major
construction projects**



The Taylor Woodrow Report

Taylor Woodrow had been early adopters of the Synchro system and had already participated in Beta trials of the software in a project in which they were building 5 new office blocks on the original Bryant Homes site in Solihull.

In this project, they had already seen the benefit of:

- using visualisation to understand the workflow implications of the contractor programmes and
- the impact of using collaborative planning software to test the reasonableness of individual contractor programmes once seen in the context of their relationship with other suppliers either in their own vertical supply chain or in the horizontal relationships created with other trade contractors.

In this it was already clear that

- some aspects of collaborative planning were unsustainable,
- resource allocations did not support the work as planned,
- material suppliers were not able to work to the lead times of on site contractors and
- productivity gains of over 30% were up for grabs from better organised working.

Fort Dunlop

It was decided to use the latest version of Synchro on the Fort Dunlop project. This was an exciting refurbishment project of a well-known Midlands landmark building to be developed by Urban Splash.

A 3D visualisation of Fort Dunlop was created and used spatially to define work areas. It was seen to be important to gain time in the delivery of the project by accelerating each trade through space so that the next work package could be started in a way that flowed efficiently through the 8 stories of the building.

As on the earlier project, work programmes were discussed with individual trade contractors. By allocating exclusive use of the space for a defined period and giving contractors the confidence that they could not only enter the space on time but could work unaffected by other trades, they were again able to shave an immediate 30% off their task times.

Another aspect of the work sought to link the timing of on site contractor work and the completion of the enabling design work. By integrating the two programmes – namely the engineers and the site team, it was clear that the site work was unsustainable as the design work was not going to be completed in the time necessary to allow procurement of materials.

At this early stage, Urban Splash decided to pursue self-management of the project. Synchro continued to work with the project team, but outside the CITB-ConstructionSkills programme. It is worth noting however that through integrating the activity of the entire supply chain in one overview of the programme, a high level of consistency and performance is achieved.

East London Rail Terminus Project

As it was not possible to pursue the Fort Dunlop project to the end, it was decided to adopt a second totally fresh and different project in which formative work was going on in preparation of work due to take place up to 3 years later.

Background:

A new railway linking the west and east sides of London with an almost entirely new line network represents potentially one of the UK's largest projects with work estimated to cost in the region of £11 billion. At the start of 2005, work commenced on detailed planning for the Enabling Works. Taylor Woodrow Construction were appointed Programme Managers for this phase of work and formed an integrated team with the Client

One of the most complex enabling work areas in the project was taken as the subject for the study project agreed with CITB special measures programme.

The engineering considerations included:

- Re-routing major water and sewerage pipes
- Demolishing a large number of industrial and commercial buildings.
- Identifying locations of existing major services and deciding their new routing
- Creating the tunnel where the railway moved from underground to over-ground
- Demolishing existing station
- Joining the old and new lines with no disruption to train movement
- Building a brand new station complex
- All logistics implications.

It was this part of the project that TWC felt benefit could be derived from using 3D linked to a work programme to gain a better understanding of the work implications, and improve the communicability of the project extents.

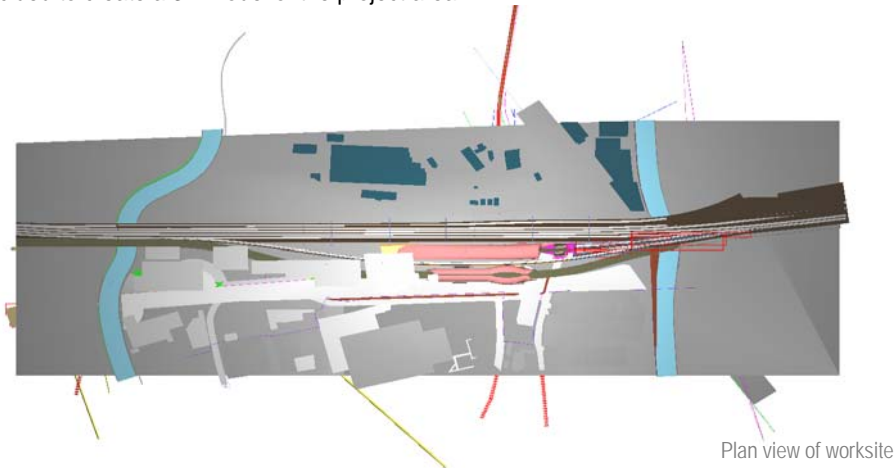
Participants:

Project Sponsor: Rennie Chadwick, Design Director Taylor Woodrow Construction
Project Owner: Clive Loosemore, Enabling Works Programme manager Taylor Woodrow Construction
Project Manager: Stephan Jones, Head of Operations, Synchro Ltd.

Method:

a) Develop 3D graphics view of total site.

It was decided to create a 3D model of the project area.



The drawings were in the course of creation at the time the project was started. They were all 2D drawings. To convert the site into 3D required the interpretation of 200 different drawings, covering every single important engineering consideration on the site.

It was decided from the first moment that the 3D had to be totally comprehensive and cover all the existing and change items in the geographical area. It was too risky to leave anything out as it might impact on the work in a significant way and therefore had to be part of the plan.

The 3D model was detailed using AutoCad and was sized at 240mb. It gives a perfect representation of the site for accurate analysis purposes even though the purpose of the 3D was to determine workflow optimisation.

b) Develop a Work-plan for the Site.

Client staff had developed a plan for the work involved on the site based on a scheme design. However the project had not reached a stage of detailed design.

The plan was originated in Prima Vera and was imported into Synchro.

The problem of having a high level plan needed to be addressed immediately. In a number of instances, a specific programme of work lasting many months was described as a single line on existing plans. This needed attention if the benefits of visualised programming were to be obtained.

Examples of insufficient detail for the full benefit of this application were:

- Demolition of numerous large commercial buildings as one block activity over 3 months
- Tunnelling described as 3 activities without concept of pace or distance to be completed by month
- Erection of major power lines over ¾ mile as one activity over 9 months.

There was a need therefore to create a plan in which the time buckets and work extents were set at a level that demonstrated no constrained use of space existed for the tasks being performed on the site.

c) Purpose of Synchro

Synchro provides a link between design and planning. It is able to work without component level design information by defining a spatial breakdown suitable for the way in which the different work activities require space to perform their different functions.

Its purpose is to give planning and supply chain managers a means of interpreting their sites, their work programmes, their constraints and risks so that they can in a collaborative way reach agreement on the best construction strategy

This calls for care in the way projects are initialised. By having a visualisation of the site that is over panoramic and not at a deep enough level of detail, it negates the ability to demonstrate how best to integrate the work of different contractors or the demands on plant or equipment or decisions on site logistics.

Visualised planning therefore needs very close collaboration between designers and planners. They almost become tied to each other and the planner has a major input to propose the site breakdown level he needs to display the way work will progress over time and space.

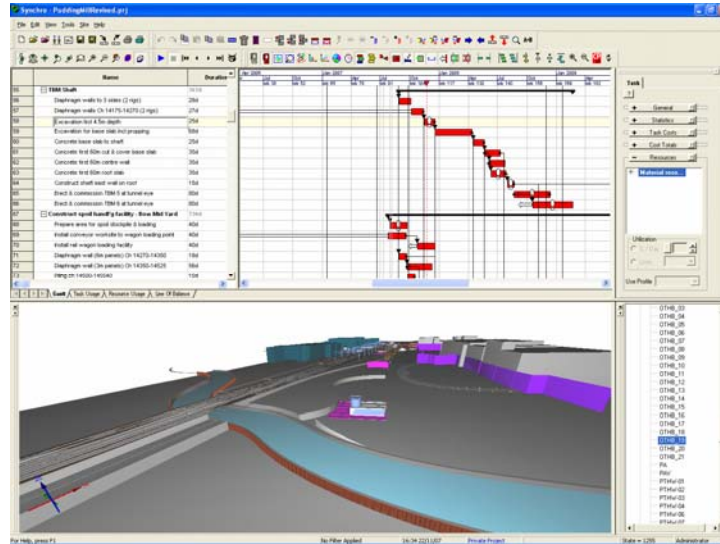
d) Synchro's contribution to the Process

This aspect is dealt with in more detail later, but Synchro now represents a unified visualisation and plan of approach to the site. As time goes by and the project moves closer to its on site phase, the programme that now exists can be revisited at will and re-calibrated to give the team the results and illustrations they want. It will serve as a means for describing the work involved in each package and have the trades' detailed concurrence to what they are going to do. The basis for improved collaboration now exists in the work completed to date.

Observations from the Project

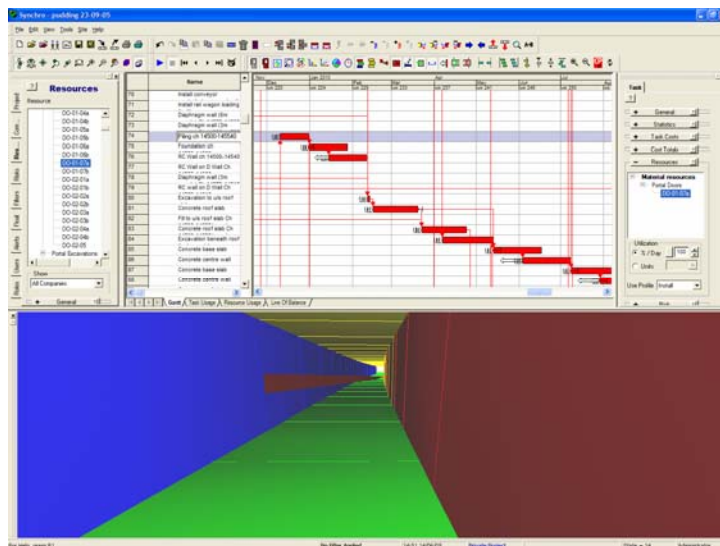
Adopting this particular project for the CITB Special Measures Programme resulted in a totally different set of considerations from the others. It illustrated that

- 3D is useful – and not just pictorial – if its level of granularity is balanced between enough detail to help determine the tasks that would be performed at any point in time based on contiguous and continuous working and not over-detailing so that the team cannot cope with the resulting complexity.



View of Synchro showing both work plan and worksite

- Planners and designers need to work hand in hand from an early stage. The designer is specifying the components that will be one day installed and the planner is putting this into a sequence and duration coupled with a resource plan. A not too faraway goal might consist of this being the planning process with a feed back loop to design as the plan demonstrates cost or engineering difficulties.



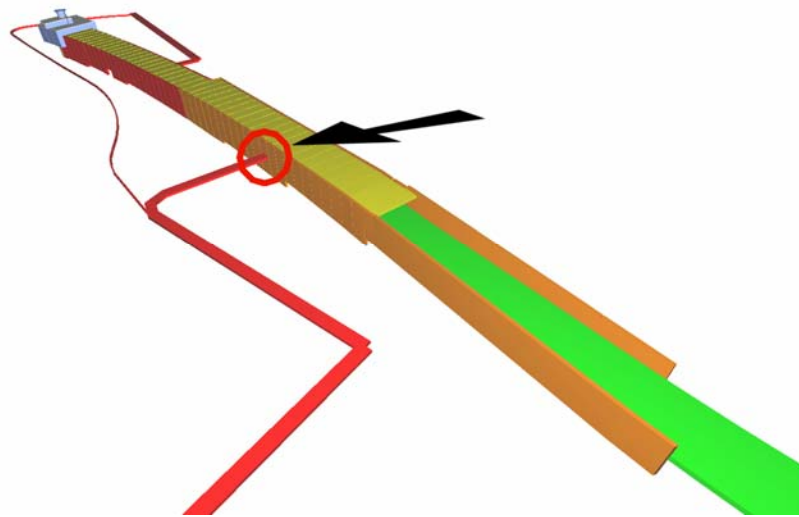
View of Synchro showing tunnel

- Only so much can be achieved in defining a programme of work before all the survey and design requirements of the site have been established. Synchro is most relevant when the work content in all the tasks is totally clear and the goal is to integrate them properly.

Particular Conclusions

- The design detail level up to September 2005 was insufficient for this particular process – it was at project stage B and not D. This meant that the real final design that was needed to do a proper job in which people had confidence and for which Synchro was useful was not yet available.

2. Ultimately a job as complex as the selected site needs 3D for it to be properly interpreted. Over time the work done in this project phase is likely to be more and more useful to help determine the logic of events.
3. Naming conventions used in both planning and design need to be compatible and descriptive. If the term 'slab' is used repetitively and then the system is to be useful in analysing one area of the site, the exact slab(s) in that area need to be found and therefore the naming has to be specific from the start.
4. Some issues in such a complex project need more detailed consideration. One illustration from this project is not the way the system interprets information, it is more about the provision of good survey information that shows what exists under the ground already and what purpose it provides. At the stage the project has currently reached, the movement of a structure two metres one way or another, could have significant implications on the work programme. In many ways, the utilities around the site are the least understood and will have the biggest impact on the way the site is completed and how much it costs.
5. The level of 3D detail is in itself a major consideration. In one example worth building on, the space required to create the tunnels is worth analysing. The creation of the walls in itself does not show the work content and space requirements as guide walls, diaphragm walls and then the rigs themselves need to be accommodated. The system lends itself to bring understanding of these types of issues.



View of tunnel approach with mains power intersection

Further Work

A further level of detail is to be supplied by the TWC/Client planners and this will result in the provision of a 4D overview of site work over the project.

It is proposed to take a model with the maximum level of refinement possible at this stage and present it to a cross section of interested management to decide what next steps might be taken.

Further Project Work

To complete the project work agreed with Taylor Woodrow for the CITB-ConstructionSkills programme, it is intended to use 3D programming as a means of streamlining workflow on a floor of the new ST Helens PFI project. The commencement of this work has been delayed pending the final Treasury financial approval of the project. A outline of the planned work is however to:

1. Model the facility in 3D
2. Break the facility down into logical spatial work areas

3. Superimpose the existing work programme onto the site.
4. Disseminate the programme in visualised form to the trade contractors working in the facility.
5. Agree through discussion in workshop environments the most efficient workflow between each contract package.
6. Deliver the project according to the agreed optimised workflow.
7. Link to the supply chain to ensure off site activity supports on site assembly work fully.

This work is planned to begin in March 2006 and the report will be added to this page once completed.