MATERIAL SUPPLY IN HOUSE CONSTRUCTION: THE POTENTIAL TO ENHANCE PERFORMANCE BY IMPROVING COMMUNICATION

Mike Bates[1], John Sturges[1], Kevin McGowan[1] and Jim Sommerville[2]

[1]*School of the Built Environment, Leeds Metropolitan University, Leeds, UK*
[2]*Alfred McAlpine Homes, Yorkshire, UK*

The interface between housebuilding contractors and their suppliers is often a source problems. We have examined this relationship from both the suppliers' and contractor's perspective. One of the main problems appears to be poor communication between the site-based activities and the supplier. Taking into consideration the 'chaotic' nature of housebuilding (due to sales driven scheduling) and the demands of both parties, a detailed plan has been developed using project management software. The intention is for this application to bridge the communication shortfall from site to supplier.

Keywords: communication, housebuilding, interface, project management software, supplier.

INTRODUCTION

At the end of the 1980s it was reported that enough materials were wasted in house construction annually in the UK to construct another 13000 houses (Institute of Metals 1987). When considered in the context of the construction industry as a whole, house building, because of the substantial repetitive elements, is the sector that could benefit most from some of the improvements seen in the manufacturing industry over recent years. The Egan Report (1998) makes reference to this point and The Housing Forum, set up as a result of the report emphasizes this and makes specific reference to the building of longer-term relationships with suppliers (Construction Best Practice Programme 1999).

Improvements have been made, but the problem of material waste and inefficiencies in the supply chain on housing sites is still an issue. Examples of some of the problems of waste and general inefficiencies in the material supply process are:

- Materials arriving late from the suppliers
- Items missing from orders
- Late call off of materials at the site end of operations
- Materials for one plot getting 'pillaged' by operatives for work on another plot
- Materials being called off too early so that they have to be stored on site for longer periods than necessary, leading to damage, theft etc.
- Changing lead times for some materials

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The bulk of these problems can be attributed, either directly or indirectly, to a shortfall in communication at the interface between the contractor and supplier. A reputable UK house builder, frustrated with the situation, allowed us to examine their site material supply systems. Investigation of many of the processes has led to the development of an IT based solution, designed to bridge the 'information gap' between activity on site and the suppliers. This paper provides a detailed consideration of material problems on housing sites, looks at the problems from both the contractor's and supplier's perspective and introduces the IT solution with some initial thoughts from both sides as to the potential of the system.

SOME OF THE PROBLEMS

When the research project proposals were presented to a gathering of the contractor and several of the suppliers recently, the response was very positive. The purpose of the meeting was to illustrate the proposed deliverables of the project and also to seek their opinions on whether it could be improved in any way as well as to discuss general issues in the supply of materials.

THE CONTRACTOR'S PERSPECTIVE ON PROBLEMS OF MATERIAL SUPPLY

One of the differences from pure 'production-line' manufacturing is that house-building programmes are largely driven by the sales department. This means that whilst the contractor can develop a 'preferred programme' prior to works commencing, sequencing of the processes is frequently subject to change. It is this chaotic environment which then makes management of supply difficult and causes many of the problems between contractors and suppliers. The site manager of the pilot site, when interviewed prior to implementation of the IT application, felt that he was only able 'to exercise minimal control over the overall planning of site activity because of the sales driven nature of operations. It is the sales department that determines the priorities that drive the build programme'.

The process is further complicated by lead times, which can change without much notice, at different times of the year. The site manager reported that 'recently, the time for some joinery product deliveries had increased from 2-3 weeks to 6-8 weeks in a very short period of time. The problem was exacerbated by the fact that he was often one of the last people to find out, which caused problems with scheduling call-offs. In summary, it was felt that involvement in the whole process of material calling off was too haphazard.

Late deliveries of materials cause significant problems. As well as immediate delays, it can result in operatives 'cannibalising' materials from other plots in order to maintain their earnings. In some cases this can result in lintels being cut down which leads to significant wastage in this particular element and according to the contractor result in the last two houses on a site requiring complete sets reordering. Similarly, incomplete orders lead to the same sorts of problems. The contractor was particularly frustrated at what he felt was a lack of appreciation of the knock on effect by the suppliers when materials were delivered late.

Sites usually have limited storage capacity. It is easy to understand the temptation of the site manager to have materials available earlier than required. It was stated that, ' we (site managers in general) are all scared of being left without materials and often resort to ordering them far too early'. This eliminates the risk of late supply and

therefore continuity of work problems. It does however, often lead to materials getting damaged or stolen. Just in time philosophies may well be the solution, but just how practical are they in UK house building currently?

THE SUPPLIER'S PERSPECTIVE

Whilst a full schedule of materials is given for a particular site, rarely do they receive a planned call off or if some form of call off is available it is usually lacking in detail and not updated very often. More often than not it is the responsibility of the site manager to call off materials, a process which, with the myriad of activities occurring on site, can occasionally be overlooked and lead to last minute alterations. The site manager was 'concerned at amount of information that carried in his head' and freely admits that under this system 'mistakes are made'.

All of the suppliers interviewed reported that they had to telephone the site two or three times prior to the despatch of the materials because the call off dates were often unreliable. Several of them reported times when materials could not be unloaded because the necessary prerequisite activities had not been completed. Similarly, the window and door manufacturer pointed out that at any one time, there was a store of around 2000 windows, which had to be kept in the factory for the above reason. This costs the firm in terms of both cash flow (inability to invoice until goods supplied) and the cost of the factory floor space.

Postponements are also very difficult to deal with because of the increasing levels of automation in the material supply process. Interestingly, the recent visit to the window and door supplier illustrates the problem. They had recently invested in some new machinery to cope with increasing demands. The new equipment would permit the plant to increase its output by about 40%, but one of the setbacks was a decrease in the level of flexibility. It was not as easy to fit urgent orders in at the last minute because the machine handled more of the processes.

Economic factors do affect demand and in times of recession suppliers do have to gear down. As demand improves there is a lag as the suppliers try to gear up production to meet required levels. As well as this being affected by longer term economic factors, in the house building sector this is also influenced by seasonal trends, more house building taking place during the better weather than at other times of the year (Harvey and Ashworth 1994).

Commitment was an issue. Several times during discussions with the suppliers this was referred to. Not surprisingly, it was felt that longer term commitment from the contractor would lead to better relations where suppliers felt they could help out in other ways rather than just supplying on lowest price.

THE POSSIBILITIES FOR IMPROVING THE INTERFACE

A comparison of the two different perspectives reveals that improved communication at the interface between the contractors and the suppliers could provide benefits to both parties.

From the discussions that followed the presentation of the initial project proposals it was apparent that the suppliers sought a greater involvement in the whole process. This is interesting in light of all the partnering initiatives that one sees in mainstream construction at present in the UK. This is even more significant when coupled with the fact that there are moves within the contractor's organization away from purchasing

on a competitive basis to a more central buying with fewer suppliers. We appear to be witnessing the advent of partnering in the housing sector.

THE USE OF PROJECT MANAGEMENT SOFTWARE AS A PRACTICAL SOLUTION TO SOME OF THE PROBLEMS

The proposed implementation of CAPM techniques was seen as a solution to some of these problems and stem in part from earlier findings of Sturges *et al.* (1997). In this previous survey the authors found that the UK Construction Industry as a whole was under-utilizing project management software and in particular found that the housebuilding sector was hardly using it at all.

Project management software enables the production of Gantt charts by manipulating the supplied task durations and the logical constraints between them. There are currently in excess of 150 project management software packages available (Laslett 1997) – for a more detailed consideration of the use of these applications the reader should seek out the work of Reiss (1995).

Using Computer Associates SuperProject v4.0d, a detailed programme of the pilot housing site was constructed (part of which is illustrated in Figures 1a and 1b). Care was taken to ensure that the 'model' dovetailed in to the company's existing progress reporting structure and that the programme was flexible enough to accommodate the necessary rescheduling that would be imposed by the sales department. Within the programme, supply dates were attached to the relevant activities with lead in times pertinent to the particular supplier. Using selective filtering and layouts the system generated the order dates for the site manager to employ and also the 'date required on site'. Examples of these two reports are shown in Figures 2 and 3.

Communication was agreed to be weekly both to the site manager and to the suppliers. Although email was available with some of the suppliers, it was felt that faxing was the preferred method. Again we were keen to fit in with current practices that people were comfortable with and not create any additional burdens. Prior to 'going live', pilot reports were sent out with a view to obtaining any final thoughts on the layout and information provided. Fortunately, the software allowed customizing of the layouts for the individual suppliers because some of them did have specific requirements, e.g. a concrete product supplier had some products which were right hand or left hand and it was felt this inclusion of this information would be useful. Order acknowledgement numbers were a preferred inclusion by several of the suppliers and a brick supplier requested some site contact details so that verification of order call-offs was simplified.

Initial thoughts from both parties on the potential of the scheme

Several direct and indirect benefits were envisaged on both sides:

- Improved co-ordination of call-offs
- General improvement in communication within the contracting side
- Enabling of better planning of production and delivery which would lead to less late loads
- Less waste due better timing of deliveries.
- Tidier and safer sites

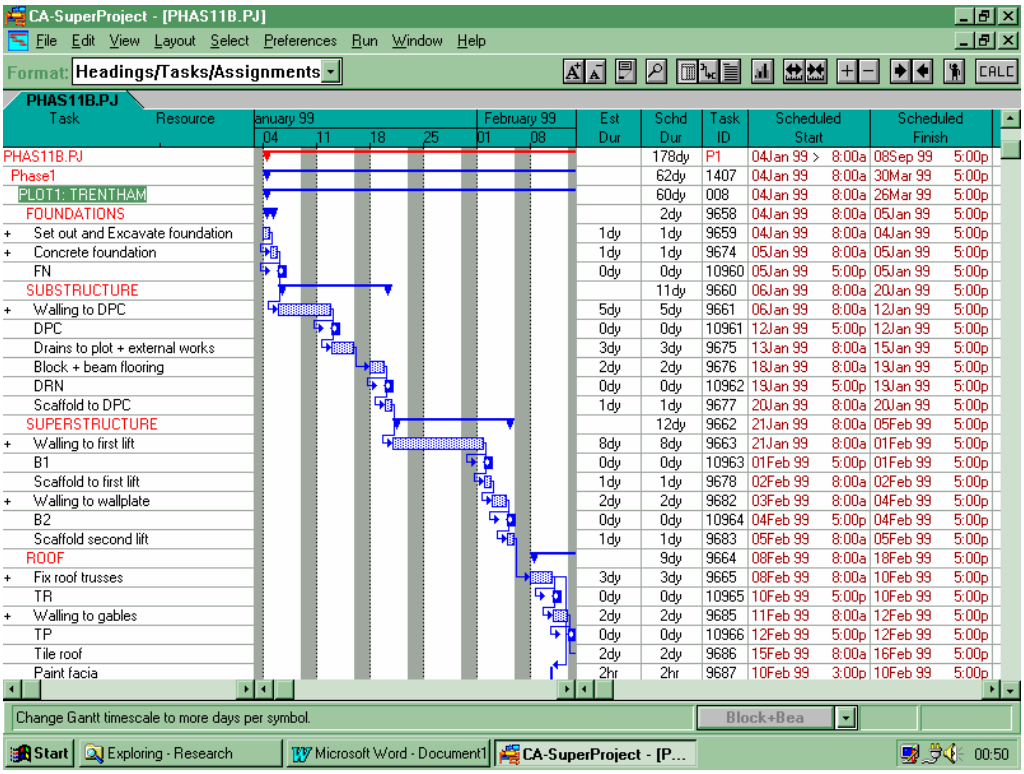

Figure 1a: Showing detailed breakdown of the project on the software package

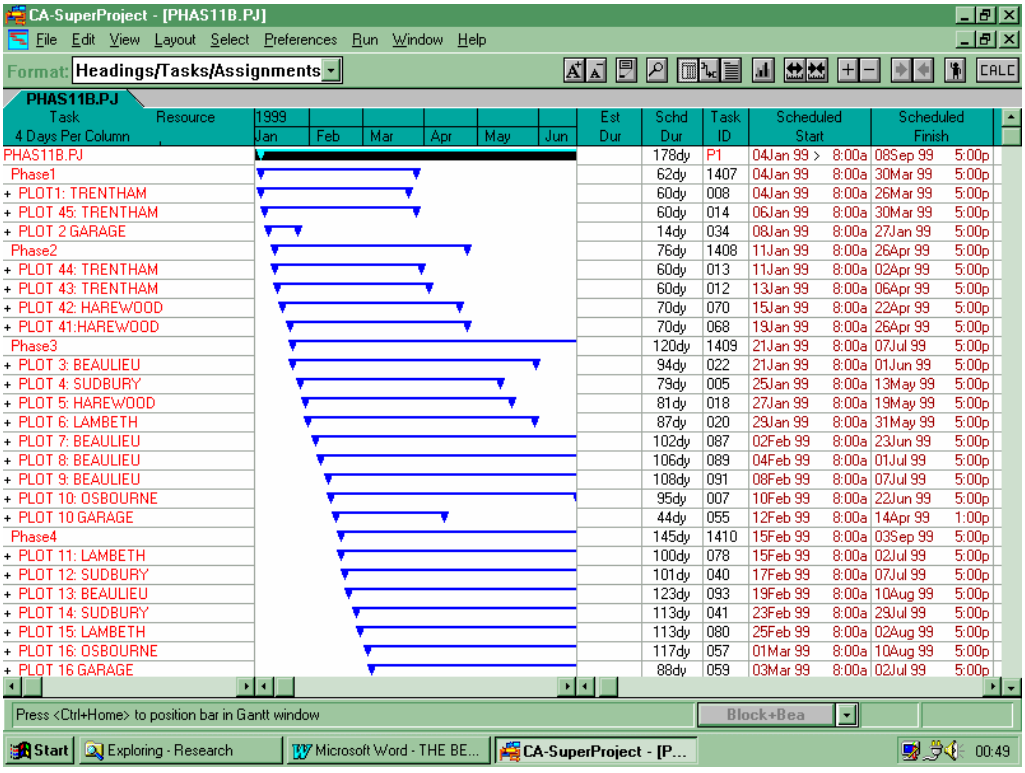

Figure 1b: The same scheme ‘rolled up’ to show more of the plots and phases

On the contractor’s side the site manager, after examining some of the reports available felt that this could be of enormous benefit. He suggested it could improve co-ordination of material call-offs whilst at the same time reduce the risk of call-offs being overlooked. He suggested that ultimately it would ‘lighten his load’.

Supplier: Date report produced: Supplier Contact Details:

Plot Number	Material	Order Date – 4 wk	Date Due on Site	Notes/Comments
Plot1: Trentham	Kitchen Flat Pack	07-Dec-98	04-Jan-99	
Plot45; Trentham	Kitchen Flat Pack	09-Dec-98	06-Jan-99	
Plot2; Garage	Kitchen Flat Pack	14-Dec-98	11-Jan-99	
Plot44; Trentham	Kitchen Flat Pack	16-Dec-98	13-Jan-99	
Plot43; Trentham	Kitchen Flat Pack	18-Dec-98	15-Jan-99	
Plot42; Harewood	Kitchen Flat Pack	22-Dec-98	19-Jan-99	
Plot41; Harewood	Kitchen Flat Pack	24-Dec-98	21-Jan-99	
Plot3; Beaulieu	Kitchen Flat Pack	28-Dec-98	25-Jan-99	
Plot4; Sudbury	Kitchen Flat Pack	30-Dec-98	27-Jan-99	
Plot5; Harewood	Kitchen Flat Pack	01-Jan-99	29-Jan-99	
Plot6; Lambeth	Kitchen Flat Pack	05-Jan-99	02-Feb-99	
Plot7; Beaulieu	Kitchen Flat Pack	07-Jan-99	04-Feb-99	
Plot8; Beaulieu	Kitchen Flat Pack	11-Jan-99	08-Feb-99	
Plot9; Beaulieu	Kitchen Flat Pack	13-Jan-99	10-Feb-99	
Plot10; Osbourne	Kitchen Flat Pack	18-Jan-99	15-Feb-99	
Plot10; Garage	Kitchen Flat Pack	20-Jan-99	17-Feb-99	
Plot11; Lambeth	Kitchen Flat Pack	22-Jan-99	19-Feb-99	
Plot12; Sudbury	Kitchen Flat Pack	26-Jan-99	05-May-99	
Plot13; Beaulieu	Kitchen Flat Pack	28-Jan-99	25-Feb-99	

Order / Acknowledgement Number:

The head of the buying department was initially sceptical because of the changeable nature of house building. When shown that the model was designed to handle changes, enthusiasm was apparent and it was suggested that an accurate list of call off dates ‘could only be an asset’. It was also hoped that it might lead to an overall improvement in the interface between office and site operations, which there was ‘room for improvement’.

The surveying department acknowledged the immediate benefits proposed and suggested that an updated Gantt chart in the main office (as well as the site office) would improve co-ordination (within the main office and between office and site) and reduce the need for site inspections. There was also interest in the use of the software to examine ‘what-if’ considerations and improvements in co-ordination of site

Site address: Date produced: Site Contact Details:

Plot Number	**Material**	**Order date** - 6 wk Lead	**Date required on site**	**Notes/Comments**
Plot1: Trentham	Door and Window Pack	23-Nov-98	04-Jan-99	
Plot45; Trentham	Door and Window Pack	25-Nov-98	06-Jan-99	
Plot2; Garage	Door and Window Pack	27-Nov-98	08-Jan-99	
Plot44; Trentham	Door and Window Pack	30-Nov-98	11-Jan-99	
Plot43; Trentham	Door and Window Pack	02-Dec-98	13-Jan-99	
Plot42; Harewood	Door and Window Pack	04-Dec-98	15-Jan-99	
Plot41; Harewood	Door and Window Pack	08-Dec-98	19-Jan-99	
Plot3; Beaulieu	Door and Window Pack	10-Dec-98	21-Jan-99	
Plot4; Sudbury	Door and Window Pack	14-Dec-98	25-Jan-99	
Plot5; Harewood	Door and Window Pack	16-Dec-98	27-Jan-99	
Plot6; Lambeth	Door and Window Pack	18-Dec-98	29-Jan-99	
Plot7; Beaulieu	Door and Window Pack	22-Dec-98	02-Feb-99	
Plot8; Beaulieu	Door and Window Pack	24-Dec-98	04-Feb-99	
Plot9; Beaulieu	Door and Window Pack	28-Dec-98	08-Feb-99	
Plot10; Osbourne	Door and Window Pack	30-Dec-98	10-Feb-99	
Plot10; Garage	Door and Window Pack	01-Jan-99	12-Feb-99	
Plot11; Lambeth	Door and Window Pack	04-Jan-99	15-Feb-99	
Plot12; Sudbury	Door and Window Pack	06-Jan-99	17-Feb-99	
Plot13; Beaulieu	Door and Window Pack	08-Jan-99	19-Feb-99	

Specific acknowledgement number:

operations in general (e.g. ‘why topcoat a single driveway and incur additional costs when ten were done four weeks earlier. Couldn’t the planning be improved to accommodate this?’). Furthermore, extending the use to consider better scheduling of sub-contract labour was proposed as this would allow a better control of the flow of this element.

The contract manager’s perspective was quite straightforward. The scheme, implemented properly should deliver substantial benefits to both sides. Better delivery co-ordination would lead to less waste, tidier, and therefore safer sites and better quality houses.

Comments from the supplier's side were equally positive. A brick manufacturer commented that as well as improving their short-term distribution schedule, it would improve their longer-term planning and if taken up by enough of their customers could reduce the likelihood of the need to change lead times. In the short-term it was pointed out that contractors who had informed them in advance of their needs would certainly receive priority in the event of a shortage.

This type of benefit was echoed by several of the suppliers and taken a stage further by one supplier who described some of the dangerous games that occur when it appears as if there may be an impending shortage of some materials. Some contractors start submitting lots of call-offs which can then lead to an unnecessary 'panic' buying. These are often unsubstantiated and lead to the supplier wasting time quelling anxieties and having to work out the real call-offs from the panic ones.

CONCLUSIONS AND FUTURE DEVELOPMENTS

The timing of the scheme appears to be opportune in terms of the economic climate. Recently, Rivlin (1999) describes the beneficial effects of low interest rates and inflation on the demand for housing. Clearly, the opportunity to pilot such a project in less buoyant times would be limited.

This project has obviously only just passed the feasibility stage, but already much has been gained from the initial reactions of the suppliers and the contractors. The reactions of both parties to the Project Management software generated reports are somewhat enthusiastic – could it be the panacea for all the ills of the supply – contractor interface?

Clearly, from the interviews undertaken and meetings facilitated, there is substantial enthusiasm. We are really only seeing some of the advantages of elementary supply chain management as suggested by many of the advocates of partnering (e.g. Harland 1996) and the authors feel as though this work is proving catalytic in developing relationships. By simply using readily available project management software to provide a regularly updated and unambiguous schedule of material call off dates, many of the supply problems that exist between the contractor-supplier interface have been addressed. This really comes as no surprise because, as illustrated above, most of the problems are a matter of poor or inadequate communication between the two parties, particularly the lack of up to date information.

Subsequent to the piloting project it is the intention to examine the implications of integrating the scheme into existing housebuilding management assuming the scheme delivers the proposed benefits. Where would this role reside? A lot of care was taken in setting up the project to ensure that the scheme fitted in with current methods as seamlessly as possible. Work is currently under way examining the problems of implementation. Findings from this study will be published elsewhere. Obviously, the more processes there are, the more difficult the system would be to integrate.

Looking forward, there may be a requirement to use the IT application to run several sites. This will make additional demands on the software model development and how it fits in with the management reporting structure. As well as extending the programme to run a number of sites, a natural extension of the use of this model would be to develop communication with the sub-contract labour (as proposed by the contractor's surveyor).

Finally, the authors are keen to support and monitor moves towards more of a 'partnering' approach for the relationship between housing contractors and their suppliers.

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