

THRIVING ON CHAOS - THE RESULT OF POOR PLANNING: SOME VIEWS FROM THE HOUSEBUILDING SECTOR

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The authors have attempted to improve the construction process by introducing a Just-in-Time system for materials delivery to site, based on CAPM software. Subcontract labour is also part of the construction process, and a similar attempt to introduce a rational system for labour allocation based on CAPM techniques received a relatively lukewarm response from subcontractors. The authors have attempted to discern the reasons for this state of affairs. The concept was enthusiastically received by suppliers of materials. They have committed labour, money and resources before they can recoup any of their costs. Subcontractors, on the other hand, commit nothing until their labour has been allocated to a job for a fixed amount of time. Subcontractors have become very good at operating within this relatively chaotic environment where a number of jobs and sites are involved. This paper explores the reasons for this difference in perception of the potential benefits of CAPM in the management of the production process.

Keywords: Just in Time, materials suppliers, sub-contractor

INTRODUCTION

The motivation for the work reported in this paper was two-fold. Firstly, the authors were aware of the waste of materials that occurs in the UK construction industry (Inst. of Metals, 1987), and secondly, they were also conscious of the industry's slow take-up of Information Technology (IT). An opportunity was seen in the potential application of IT to improve several aspects of the industry's performance.

Earlier work by the authors (Sturges and Bates, 1997) has shown that the exploitation of CAPM by the UK construction industry is patchy and limited. In other words, while many firms are beginning to exploit these methods, there are still many who are not using them. The work also showed that, where such methods were being used, they were only exploited to a limited extent. The firms using CAPM software were not exploiting the full power of these packages. These findings tended to confirm what other authors have described (Harvey and Ashworth, 1997). Naturally, the possible reasons for this state of affairs was sought via a number of channels. Informal discussions with representatives of senior and middle management in the industry indicated that most firms lacked any kind of integrated system for handling management information. So while those responsible for planning and scheduling the work programmes might well be using good CAPM software, their colleagues in the costing and finance section would not. Indeed, the finance people would have their own system for organising their data, which was usually incompatible with that used by the planners.

This was investigated by the authors (Sturges, Bates and Archer, 2000), and a limited survey carried out on a sample of small, medium and large firms confirmed that integrated data handling systems were not used by the industry. These investigations, together with the belief that the industry was not being as economical with materials as it could be, prompted the authors to consider developing some CAPM type software to implement a Just-In-Time (JIT) system for the supply of materials to construction sites.

This was viewed as possibly the first step in applying IT to the management of site operations in general. The two major day-to-day concerns on site are the ordering, delivery and use of materials and the organisation of labour. The way these are done on many sites can be rather chaotic, and the authors quickly became aware that whereas the labour sub-contractors appear to thrive under these conditions, the materials suppliers do not. However, the materials supply area was tackled first.

JIT SYSTEM FOR MATERIALS SUPPLY CHAIN

The problems encountered with materials being on-site well before they are actually required are well-known, and include theft, damage, cannibalisation, etc. In 1987, it was estimated that the industry wasted sufficient materials for the construction of over 13,000 houses each year, at a time when the number of housing starts was of the order of perhaps 160,000 to 200,000 per year (Inst. Metals, 1987). The UK industry is highly competitive, and the need to control costs has undoubtedly led to a measure of improvement since 1987. However, there is still plenty of scope for improvement, and the reasons are wider than those of economy in the use of materials.

The authors have worked with a UK housebuilder who is receptive to the idea that present methods of materials procurement and delivery need to be improved. CAPM software has been adapted to allow a JIT materials delivery system to be implemented. This system has been described elsewhere (Bates *et al.*, 1999), and it involves putting the materials requirement details of all the houses on a site onto the computer, with the ability to display the current status of each house plot. The details are up-dated at least once weekly, and so material call-offs can be timed with some degree of precision. The authors felt that the implementation of such a system would have undoubted benefits for both the housebuilder and the material supplier. If such a system is to be implemented, the concept has to be accepted by the suppliers of materials, and the housebuilder agreed to facilitate a meeting of their suppliers, so that the ideas could be explained to them, and their comments and reactions obtained.

Materials Suppliers Response

The authors therefore gave a presentation to a meeting of the materials suppliers' representatives, convened at the headquarters of the housebuilding firm. The ideas were presented in a constructive spirit, showing that nothing was being pre-determined, but rather the authors wished to obtain the suppliers' response. However, the ideas were immediately received with great enthusiasm. It was pointed out that the weekly updated schedule could be placed on an Intranet computer network system so that it could be accessed by the suppliers themselves. The benefits to the builder and to the suppliers were all very quickly and clearly grasped. The suppliers invited the authors to visit them at their own headquarters to discuss their problems further, and to explore the possible benefits of the proposed new way of working. As a result the authors paid subsequent visits to a firm of window manufacturers and also to a brick manufacturer.

The discussions during these visits gave strong confirmation of the soundness of the ideas as far as the material suppliers were concerned.

JIT SYSTEM FOR THE ORGANISATION OF SUB-CONTRACT LABOUR

The authors viewed the materials supply situation as perhaps just the first stage in a thoroughgoing overhaul in the way the industry managed its day-to-day business. Another large element of the work to be done on site is the organisation of sub-contract labour.

On a housebuilding site there will be a mix of standard house types, and the labour requirements for each type will be just as clearly quantified as the material requirements. The authors therefore carried out further modifications to the software to enable the status of the site to be monitored in terms of labour requirements. These modifications were done with the full collaboration of the housebuilder. As before, a meeting was convened at the housebuilder's headquarters, and this time representatives of the various sub-contractors were called together. These included bricklayers, roofers, electricians, plumbers, etc. Again, the ideas were offered and presented in a helpful spirit, and the contractors' responses were sought.

Labour Sub-Contractors' Response

The contrast with the reaction of the materials suppliers was remarkable. This time there was a measurable pause before someone remarked that it might be a good idea. Potential problems were raised, some real and some imagined, and these were interspersed with a few favourable comments. The authors were immediately struck by the differences in the reception given to the idea by the materials suppliers and the labour sub-contractors, and began to seek the possible reasons for these differences.

THE LABOUR AND MATERIALS SUB-CONTRACTORS' PERSPECTIVES

The material suppliers frequently complain that builders order materials too early, before they are really required. Two scenarios can result from this; the materials may be delivered to site, usually at the request of a site manager who seeks the comfort of knowing his materials are to hand, or the supplier is asked to hold the materials until they are definitely required. Both these situations are unsatisfactory; the first because the materials are exposed to damage, theft, mis-appropriation, etc. and the second because the material supplier has laid out resources (materials, labour and energy) in producing them, and is faced with a wait of unspecified duration before he can submit an invoice. The first scenario is also unsatisfactory because, as a result of loss, theft, etc. the builder will often have to place a subsequent small order for materials to replace his losses. Such small orders are uneconomic to produce, process and deliver, and can result in hold-ups in completion of the houses.

It became apparent in discussions that some builders are far-sighted in that they appreciate the material suppliers point of view, and appreciate the benefits of being realistic in their order dates and lead-times. Others give no thought to the suppliers problems. Suppliers, on the other hand, explained that they gave preferential treatment to builders who were prepared to work with them in a realistic way.

The magnitude of the problem was dramatically illustrated during the visit to the window manufacturers. This was a company making uPVC window frames and doors.

This firm was investing in new machinery to improve its productivity and reduce operating costs. However, it was when they showed the authors the area where they stored windows which had been made to order, but not yet called off, that the size of the problem became apparent. A large bay of the factory building of several hundred square metres area was filled with window and door units numbering several thousand. Conservatively, the value of this production must have been several hundred thousands of pounds.

Windows are a high-value product. Bricks on the other hand are lower in value. However, discussion with the brickmakers highlighted related problems. Brick manufacturers are selling surface textures and appearance as much as structural strength, and the problem with bricks is that identical colours cannot always be guaranteed between two consecutive firings of the same type. A builder will obviously wish to avoid colour differences in a group of houses built on a site. He may be building 100 houses, each requiring 14,000 bricks. His total requirement will therefore be for nearly 1.5 million bricks. A look at the brickmaker's showroom and catalogues quickly revealed that a brickmaker could be offering hundreds of different colours and textures in total. Although bricks are cheap, the brickmaker could be faced with the same problems of acting as stockholder, because of the large order sizes and the large number of colours and patterns being produced. Again, the brickmakers were aware that they needed to be as flexible as possible, but in order to operate efficiently, the co-operation of the builder was essential.

The plea made most frequently during the meeting was the plea made by the suppliers for commitment. By this they meant a move away from the first glance, lowest cost mind-set towards a long-term Partnering type arrangement. They knew that they could nearly always offer much better service and terms to builders who entered a long-term relationship with them. Subsequent conversations with them reinforced this point. If a builder has a fickle buying policy, the supplier will generally accord their orders a lower priority than orders from regular customers. Work carried out by the authors on methods used in the aircraft manufacturing industry showed that long-term business arrangements are the norm (Bates *et al.*, 1999). Both sides recognise the benefits which flow from such arrangements. Long-term arrangements can provide the basis for innovation and improvements to the process as a whole (Sturges *et al.*, 2000).

The operating objectives of the materials supplier are to produce the required materials as closely as possible in time to when they are needed, to deliver them to site as expeditiously as possible and to submit the invoice to the builder without delay. Payment follows after the usual thirty days. None of these objectives is in conflict with the builder's objectives.

The labour sub-contractors face a quite different situation. Like the material suppliers, their services are in demand from many builders at any one time. They therefore have to schedule their labour gangs to satisfy their various clients. The parallels with the materials suppliers ends here, however. The reason is that unlike the materials suppliers, the labour sub-contractors commit nothing until their men go on site. Furthermore, as soon as their men have completed a week's work, they can begin submitting invoices to the builder. There is no unspecified delay between commitment of resources and recovery of costs (plus profit) as there is with the materials suppliers.

Anyone who has had domestic building work done knows that builders nearly always have more than one job in progress, and that when no-one turns up on any particular day, they will often be given as an explanation the urgent demands of the "other" job.

The comments made by the labour sub-contractors at the meeting confirmed this situation. The familiar litany of reasons were all given; many of these are genuine, and many are used as cover excuses for failure to turn up on any particular day. However, looking at the situation from the contractors' point of view, the authors could see that they had become very adept at juggling their resources to meet the simultaneous demands of their various clients. This is not an easy situation to cope with. Indeed, it can be rather chaotic; beside the time pressures imposed by the various jobs, at various stages of completion, there will also be the vagaries of the weather, the availability of materials, and other factors. The contractor has to attempt to keep his men as fully employed as possible, and as a group, contractors have become skilled at doing this on a day-to-day basis. Their priorities are different from those of any one builder.

The contractor knows that his men must be paid. He obviously seeks to get the most work from his labour force each week. To do this, he "optimises" on the use of his labour resources between the demands of his various clients. While this is logical to him, it can look very different from the point of view of any one of his clients. So on any given day, the contractor's objective can be in conflict with the builder's objective, if, on that day, the labour gangs are working for other builders on other sites.

There is a further, and possibly even more important point at issue here. This is the question of management control. If the labour sub-contractor went along with the IT resource allocation method, he would be surrendering control (at least in part) of his labour force. He would need to be very convinced of the advantages of such a system before signing up to it. On the other hand, IT is making an increasing impact in construction, and enlightened firms are now seeing that they have to embrace it in future. Labour sub-contractors who do not embrace IT may become left behind, and their services used less frequently.

It will be necessary to address the sub-contractor's concerns. There are perhaps three potential sources of problems on-site. These include:

Changes in priority, usually sales-led;

Bad weather; and

Failures to deliver, by materials suppliers, by other contractors, by other interested parties (inspectors, etc.)

These problems can obviously interact. At present, all parties, builders, materials suppliers, sub-contractors are working on partial information. They are working on their perceptions of the status and progress with each job. Word of a failed materials delivery may induce a sub-contractor to send his gang to another site, for example. Or failure by one sub-contractor to complete their part of the job may cause another sub-contractor to delay sending his labour onto the site. However, the delays may be brief, and not sufficient to justify the decisions taken.

DISCUSSION

So what can be done? It remains true that everyone will work better with a fuller sharing of information. A labour sub-contractor would be better able to make informed decisions on allocation of labour if he had access to up-to-date information about the status and progress of the various jobs with which he was involved. Materials suppliers would be in close touch with progress and they could make

intelligent decisions about the timing of their deliveries. While materials suppliers and labour sub-contractors operate in different ways, they are both interested in achieving the optimum timing for their input. With optimum timing, the materials supplier gets the quickest return on his outlay, and similarly, the sub-contractor gets the best use out of his labour gangs.

The labour sub-contractors have become very skilled at “juggling” their labour gangs between sites. To them perhaps, the potential reduction or removal of this disorder and its replacement by a more planned arrangement appears as a threat. However, it need not be so. All parties in the industry are interested in improving the quality of the process and the product. Two developments would make such improvements easier to achieve. Firstly, the advent of long-term business arrangements between the builders and their material suppliers and sub-contractors, and secondly, the implementation of working practices where information was shared more fully. Successful builders already tend to use reliable suppliers; people whose quality of work they know they can trust. Such arrangements could equally benefit labour sub-contractors. If this were to happen, they too could benefit from having up-to-date information to work from in making decisions about the allocation of labour. Additionally, if the major contractors begin to use IT in their day-to-day site management, the sub-contractors are going to come under pressure to accept it too.

To sum up, therefore, the materials suppliers can see clear benefits to themselves and to the builders from a mutually accessible JIT system such as that outlined in this paper. The sub-contractors, on the other hand, view such a system as a possible threat. For all parties achieving the optimum timing of operations and deliveries is of prime importance. The sub-contractors’ reservations must be allayed, and this could perhaps best be achieved by running a demonstration project, such as that planned and described in this paper..

CONCLUSIONS

While the software development is still ongoing, the housebuilders and the material suppliers are convinced that the proposed system is a viable one. They can clearly see the advantages that would accrue by implementing such a system.

The materials suppliers can see definite advantages to them and to the builders by reaching some long-term business arrangement.

The labour sub-contractors can see that the system might work, but they cannot see that it would work to their advantage, and this explains their rather lukewarm reception of the idea.

ACKNOWLEDGEMENTS

The authors thanks are due to McAlpine Homes (Yorkshire) Limited., and in particular to Mr. J. Somerville for facilitating the meetings and contacts described in this paper.

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