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Investigating first planning in construction

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There is a divergence of research opinion as to the efficacy of detailed front end construction planning (first planning) and its use for strategic or tactical purposes. What really happens in planning construction projects is considered by focusing on comparing the responses of key stakeholders in the construction planning process. Contrasting perspectives of office- and site-based staff upon the accuracy of project timescales are identified together with their dissimilar methods of programme development and preferred first planning detail level. Consistently divergent views are expressed by office-based preconstruction planners and site-based construction project managers, including a reluctance to engage others during first planning held by the former and a limited belief in completion of the project to another's timescale (without their personal input) expressed by the latter. Significant role-based discrepancies in their approach to first planning are revealed and the potential for further research into cultural and behavioural motivators is highlighted.

Keywords: First planning, project planning, construction planning

Introduction

Construction project time performance has long been identified, together with cost, quality and safety as one of the four main critical success factors in any construction project. The initial planning framework of a project, including contractor commitment to the overall construction timescale, is set during the preconstruction 'first planning' period. Adequate preconstruction planning is therefore recognised as essential to limit potential for later construction delays and cost overruns. However, many recent industry initiatives, such as Last Planner™, while recognising the need for accurate planning at the strategic level, have resulted in much focus upon improving site-based construction planning. This, of course is *after* the contractor has irretrievably committed to a contractually binding construction project timescale. The production of feasible preconstruction and project master plans is essential to achieve later success during the construction phase and any failure in producing this can affect both the client's and contractor's success and negate or neutralise any successful onsite planning. The purpose of this research was therefore to investigate the area of first planning in construction and the potential for improvement.

The term 'first planning' as applied in the study describes the initial construction planning which takes place during the preconstruction phase of a project. Depending upon the specific procurement methodology employed, this may take the form of informal strategic planning advice, direct negotiation or competitive bid tendering and also encompasses the development of the project master construction programme. Preconstruction planning efficiency has been identified as of crucial importance in the successful delivery of any project (Dvir *et al.*, 2003; Gidado, 2004; Waly and Thabet, 2002). During preconstruction, planners add value by attempting to ensure that planning is based on a robust understanding of the methods, time and space required to carry out tasks while also identifying and communicating the potential risks involved (Kelsey *et al.*, 2001). Their output can be highly influential in demonstrating the contractor's competence when tendering for projects not awarded purely on financial criteria (Winch and Kelsey, 2005) and set the initial planning framework for later development by decentralised techniques such as Last Planner (Ballard,

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Table 1 Summary of selected research methodology

Activity	Method
Desktop study	Unstructured telephone interviews to validate research proposal and identify objectives
Literature review	Identify, analyse and report on existing theory
Primary data collection	Qualitative, attitudinal survey using semi-structured interviews with various industry professionals employed within the roles of office-based preconstruction planning, site-based construction planning, site-based construction project management and finally, client-employed project management
Data analysis	Data reduction and interpretation through content analysis and categorisation and systematic coding of responses
Results	Subjective review and comparison with literature

2000a). An additional concern for first planning is the quality of the planning of design work and its input into the master plan. The levels of concern over this depend, in part, on the procurement method and whether the problem is viewed from the client's or the contractor's point of view. It could be considered that the contractor is less concerned with this in traditionally tendered projects where design is meant to be substantially complete before they are involved in the project. For the purposes of this paper, the area of design planning and management was considered to be too challenging and problematic at this stage (it will be the subject of further research). The paper, instead, considers the challenge of delivering the construction stage and the relationship between first planning and successful project delivery.

Research design

The aim of this research was to consider what happens in real projects in the UK construction industry. The proposal was to carry out a study of the actual role and purpose of first planning in main contracting organisations and how it was used in practice. To do this the authors investigated the methods and processes employed by main contracting organisations to produce first plans and the various factors and pressures applied to determine first planned duration as well as the perceptions of those involved in producing and using the plans. A specific decision was made not simply to track the performance of programmes on projects as there has been sufficient challenge to their performance in recent years (Burrows *et al.*, 2004). The researchers proposed therefore to analyse the roles and efficacy of first planning and the resulting impact upon plan perception and effectiveness in use. Table 1 describes the research methodology selected for use in the study.

The scope of the study was constrained in that it only encompassed interviewees employed within two large main contracting organisations and was geographically limited to the North East of England. However, with large yearly local turnovers in excess of £50 million each, these are considered to be generally representative of the industry. Sample size was set at three planning stakeholders from each of three categories (plus one triangulation interview from someone who uses plans but is not involved in their production). This resulted in 10 semi-structured interviews with industry professionals with construction experience (see Table 2). The categorisation and description of the roles of each of the interviewees is included in Table 3. A degree of investigator triangulation was achieved through actively involving a client-employed project manager in the interpretation of data at the conclusion of the study. It is accepted that the content analysis method of data examination used in the study has been criticised for imposing convenient categories established from existing theories outside the data which may obscure the view of the contents of the text rather than facilitate their interpretation (Flick, 2002). The results of the research may therefore be criticised for not representing a definitive review of first planning, but the authors believe that the results give initial clarification to issues affecting a key area of planning perhaps recently ignored in favour of an increasingly downstream focus.

Table 2 Interviewee age profile and construction experience

Age profile		Construction experience	
40–44 yrs	1	20–24 yrs	1
45–49 yrs	3	25–29 yrs	2
50–54 yrs	2	30–34 yrs	3
55–59 yrs	3	35–39 yrs	3
60–65 yrs	1	40–45 yrs	1
Total	10	Total	10

Table 3 Interviewee role and formal educational attainment

Interviewee role and formal educational attainment	Total	HNC	BSc
Office-based preconstruction planner (responsible for planning during bidding before site team is involved)	3	1	2
Site-based construction planner (responsible, with the site team, for producing plans on site once site starts)	3	3	
Contractor's project manager (responsible for project delivery including planning the project once site starts)	3	1	2
Client's project manager (interested in the outcomes of planning but without input into plan production)	1		1
Total	10	5	5

First planning theory

Role, process and methods

Construction planning is aimed at making effective use of space, people, materials, plant, information, access, energy, time and money in order to achieve the set project objectives and is made up of four main parts: (1) programming and scheduling; (2) method statements; (3) organisational systems; and (4) site set-up and layout (Gidado, 2004). These four parts are interdependent both with one another and also with the environment surrounding the project, while the planning strategies proposed are 'refined' by considering the financial and physical constraints imposed with the aim being to implement reliable cost, time, quality and safety plans. The major goal of *the contractor* during this period is to generate revenue by winning and successfully executing profitable contracts. The primary role of *the planner* is to ensure that plans are realistic and prevent excessive exposure to risks of the project running over time or cost or of compromising quality, but without being so cautious that the contract is awarded to a less pessimistic competitor. A secondary commercial role that a planner can perform is to enhance the contractor's reputation by demonstrating superior competence to clients and thereby gain opportunities for repeat business, particularly if the increasingly popular two-stage tender process is used where price may be secondary to best value tender submission during first-stage decision making (Kelsey *et al.*, 2001). For the contractor, plans are used for cost estimating and cash flow forecasting of the project at the tendering stage (Odeyinka and Lowe, 2001) and if the agreed project duration is too short then time-based tender items priced in accordance with the periods shown in the programme may be undervalued and result in consequential financial loss (Laptali *et al.*, 1997) and/or liquidated damages arising on late completion (Farrow, 1984). Kelsey *et al.* (2001) also propose a series of medium-term job goals which the planner seeks to add to those short-term goals already discussed, including maintaining and expanding working relationships and developing skills for future competitive advantage.

Theoretical issues

A review of the literature suggests that there are a number of issues that affect the worth and usefulness of first planning.

During the preconstruction stage, planning decisions are made at the macro-level and are mainly concerned with design review, site investigation, selection of the construction sequence and procurement of the major elements required for the execution of the work. It is considered essential to create preconstruction and project master plans that are feasible as their overall reliability and achievability is deemed a prerequisite for later success during the construction phase (Miyagawa, 1997). Ballard (2000b) termed this process 'front end' planning and identified the action as a key part of the project definition and design phases of the Lean Construction Institute's Lean Project Delivery System. However, Ballard (2000a) also suggested that the traditional way of using this front end planning in construction can be considered the ultimate source of 'schedule push' in many projects. This 'pushing' of the plan is seen as a key factor in the perceived lack of success in achieving project time certainty and time to complete. Ballard's Last Planner (2000a) technique suggests that the first plan, which he believes should be essentially about strategy and feasibility, has traditionally been used as a major driver of the tactical planning of the project. Ballard appears to support a need for the passing on of reduced detail in first plans to production managers who can then add detail at the 'correct' level

through phase scheduling and the use of Last Planner. Kenley (2005) argued 'The correct lean position should be that proper planning should be a requisite starting point'. By 'proper planning' Kenley appeared to mean detailed front end planning. The problem arising here seems to be how to make a clear separation between a detailed and comprehensive strategic plan to 'prove' the project and then a reduced output 'target' provided to the project team on which to apply Last Planner tools.

Laufer and Tucker (1988) concluded that, while specialist planners have the time to do the work and better strategic decision-making skills, they may have incomplete practical knowledge, limited detailed information available and also lack final decision-making authority. Conversely, construction managers may have improved practical knowledge and possess decision-making authority but lack the time available to plan. Laufer (1992) claims managers often see the delegation of planning authority to others as a threat to their position and treat such plans as irrelevant forecasts. Johansen (1996) agreed, finding that due to a desire for autonomy and inherent mistrust, construction managers often ignore the formal project master programme and instead adopt their own 'flexible' approach to planning on site. Winch (2002) stated that as a result the master programme becomes detached from the realities of the weekly management on site—a problem which Last Planner seeks to address.

Laufer and Tucker (1988) also concluded that detailed planning of activities to be carried out far into the future adds production and monitoring cost, hinders a clear overview of the project and is generally futile owing to uncertainties which cannot be quantified and they recommended that first planning be at the *lowest* level of detail possible. Ballard (2000b) agreed that the main purpose of 'front end' planning is to demonstrate the feasibility of the overall project duration and does not require a high level of detail, while Ballard and Howell (2003) highlight the potential waste and early obsolescence in proceeding with early detailed planning. These views contrast with Gidado (2004), who recommended that *more* detailed planning is required to improve preconstruction planning efficiency. Faniran *et al.* (1999) also investigated the relationship between construction planning effort and planning effectiveness to attempt to identify the optimum level of planning and concluded that *both* too little and too much planning can lead to poor project performance.

Burrows *et al.* (2004) reported that the 2003 national key performance indicators (KPIs) demonstrated that the industry's ability to predict the time a building will take to construct is significantly worse than its ability to predict how much it may cost, with some 25% of projects experiencing increased costs over the construction period, but with nearly 40% overrunning their originally contracted timescale. Research by Johansen (1996) confirmed that many contractors view their own plans as likely to be unachievable.

Kelsey *et al.* (2001) suggested that systematic review of completed projects to improve planning are in fact rare; claiming planners tend not to refer to past job records as they are either non-existent or considered inaccurate and that those who could potentially contribute most to this process have the least motivation to expose their own errors. Johansen and Porter (2003) highlighted the need for improved subcontractor planning competence, their increased input and closer involvement in the planning process and the availability and distribution of accurate subcontract trade performance output and resource data.

Winch (2002) proposed that overall project programme methodology is often effectively formed during the tender or preconstruction period and quickly becomes enshrined within the master construction programme; therefore subsequent programmes developed to actually *manage* the project are constrained by decisions often made in haste during preconstruction.

Ward *et al.* (1991) identified that clients' project duration expectations are either formed from their own past experience of similar works or based upon guidance from specialist advisers. Thus, the initial assessment of overall project duration stipulated to the contractor may be carried out by the client, an architect, an engineer or a trained planner.

One other area of interest is the use of predictive models to assist planning. Various mathematical models have been produced and tested which are claimed to predict construction time to an acceptable level of accuracy using partial correlations and multiple linear regression analysis (Love *et al.*, 2005). An early investigation by NEDO (1988) proposed a link between project cost and planned construction time and provided a pair of clock-type circular scales used to 'dial' a 'good' or 'average' construction duration. Recently, simulation techniques, fuzzy set theories and genetic algorithms have also been applied (Ahuja and Thiruvengadam, 2004). In addition, Waly and Thabet (2002) claimed that the use of 4D planning would enable the contractor to undertake inexpensive rehearsals of major construction processes to test planning strategies prior to the actual start of site construction.

Interview results

The issues which arose in the literature were used as the basis for questions about the process within the

semi-structured interviews carried out. These are discussed here.

Stipulated programme durations

The timescale for the construction of a project is most often stipulated by the client to the contractor when bidding, although an optional alternative (presumably—although not always specified—shorter) period and associated cost premium are also commonly invited. Occasionally no construction period may be stated and an individual assessment is instead requested from the contractor, introducing added competitive considerations within the programme duration. Without exception, all interviewees claimed to ignore periods provided by the client and instead calculate the realistic (rather than optimum) timescale they believe is required to complete the project, including evaluation of the earliest start date as well as the end date and adding of informal 'buffer' time at key points to manage uncertainties. They then compare their assessment with that stipulated and if (as appears not uncommon) it is too long, seek ways to reduce the programme, either through revised logic or deployment of increased resources. This method appears to enable them to evaluate the risks associated with attempting to construct the project within the client's preferred timescale while also communicating them more clearly to upper management for their final decision making.

Although the method of programme assessment described was common across the entire interview group, a clear divergence of opinion was reported regarding the perceived achievability of client stipulated project durations. The office-based preconstruction planners *all* believed the timescales stated to be generally *accurate* on a regular basis and assumed some prior involvement of a trained planner to provide guidance. However, the site-based construction planners and contractor's project managers *all* equally believed that periods were typically *inaccurate* (unless the period was provided by the contractor and negotiated directly between the parties) with a remarkable concurrence between each individual interviewee's assessment that up to 70% of client-stipulated construction project durations are too short. Periods were believed by these site personnel not to be based upon an accurate assessment of the individual scope of works but, as commonly suggested within the literature investigated, often to be driven by the business objectives and financial pressures on the client to gain a speedy return on their investment, since as one senior project manager concluded, 'time is money for clients'. In addition, the site-based groups believed there to be an increasing trend in recent years to consistently reduce programme timescales, one site-based planner arguing that 'contractors are expected to go faster and faster—clients just won't accept the true period required'. The contractor's project managers were particularly critical of this phenomenon, believing that the quality of project handover is inevitably compromised in the push to complete on time and that consequently many projects suffer significant problems post-practical completion to the ultimate long-term dissatisfaction of the client. The client's project manager emphasised that the assessment of stipulated periods was generally based upon the precedent set by previous similar projects of which he was aware, rather than upon a detailed examination of the individual project programme. He therefore relies heavily upon the contractor's professional expertise and integrity to ensure that timescales proposed by either party are achievable and while commercially driven deadlines are often a key consideration, an unreasonable timescale would never be deliberately stated.

Information sources for planning

The information used by interviewees to plan was derived from three principal sources: past experience, empirical performance output data and informal consultation with others. As suggested by the literature, personal experience was consistently valued above all other sources by the entire interview range and estimated to guide up to 90% of the overall planning process. Established trade performance data collated from various construction company work study sources, although still relevant, were considered largely outmoded by many planners and increasingly superseded by ad hoc guidance notes of personally observed (i.e. experience based) performance of previous projects. While the nomadic existence of the site project managers and site planners perhaps unsurprisingly meant they retained little written data, more unexpected was the office-based planners' similar reliance upon personal experience rather than rigid performance data, particularly given their necessarily much more limited exposure to today's onsite processes. The office-based planners did indeed acknowledge concerns that their limited site contact failed to expose them to new technologies and for this reason their reported reluctance to also consult subcontractors for guidance is all the more surprising. This unwillingness is based on a belief that many subcontractors hold their own agenda during preconstruction and while 'they are better placed to comment on their own works package, they do not see the full picture'. Consequently, office-based planners reported they are more likely to consult their office peers for advice than to involve subcontractors at this early stage. Conversely, the site-based planners and project managers (although dissenting in

two cases) were much more inclined to consult subcontractors for their advice during preconstruction, perhaps explained in part by their successful working relationships built on previous projects. In addition, while the one dissenting project manager cautioned against potential for subcontractor 'commercial spin', he still acknowledged 'their guess is better than mine'. Similarly, the single objecting site planner first categorically argued that 'subcontractors will not give you accurate information at the preconstruction stage', but later (while espousing the benefits of his company's progressive supply chain policy) recommended that 'we must get major subcontractors on board earlier in the process…!'.

The involvement of the project manager elect in first planning gained a mixed response from planners in the study and on the whole was largely negative. While two planners acknowledged the key benefits of ownership and adoption, the remainder were equally sceptical and questioned management commitment to the process; both views commonly reported within literature sources. One planner described project management input as 'meddlesome and disruptive' while another regretted he could 'rarely find a manager capable of finding the time needed at preconstruction stage'. Surprisingly, these views were shared equally between both office- and site-based planners. While one could perhaps foresee the more 'solitary' working attitude of the former, the latter could equally reasonably be anticipated to be more readily appreciative of management input, given their regular exposure to site team working. Similarly, though for different reasons, there was reluctance by all parties to consult the design team during first planning (except to clarify general queries) primarily due to lack of time available, but also for fear of revealing any potential commercial advantage.

The quality and quantity of design information used to plan unsurprisingly varies with contract type and individual design team. Time constraints meant that an office-based planner admitted that 'too much information is sometimes a problem—you feel obligated to look at everything' while a site planner argued that 'you can never have enough information—but it can make you less competitive'. Perhaps these dissimilar views are indicative of the relative timescales often available for each to review information; the office planner working to a submission deadline, while the site planner is typically used to having more time to evaluate information on site, thereby influencing his perception.

Planning deliverables and time available

All planners in the study believed that an increasing quantity and quality of submission deliverables were now required and anticipated respectively within project enquiry responses and almost all questioned both the necessity of providing such detailed information at this early stage and whether it was actually ever read in full. Speculation of rationale ranged from 'ticking of standard boxes' to (more controversially) justification of professional management fees by those charged with review. The client's project manager responded that submission deliverables depend upon the individual nature of the project (e.g. particularly sensitive location, explanation of complex phasing, etc.) and are often driven by the specific needs of the client and categorically stated that if requested, a deliverable was by definition essential to the bid and would therefore be reviewed in detail. He also emphasised that some contractors voluntarily add additional information *not* originally requested in an effort to further impress.

The production sequence of deliverables is, as suggested within the literature, largely driven by the project programme—which is also universally seen as adding most planning-derived value to the overall bid. A belief that there was consistently inadequate time to plan both prior to award and prior to commencement of work on site was highlighted by all contractor interviewees. However, in all cases (and contrary to some literature) this was claimed not to impact upon the accuracy of their planning output but rather only upon the quantity, one planner arguing that 'time available to plan does not limit reliability but can limit deliverables'. They argue that the production of the programme and costs are given priority due to their criticality and effort is only then applied in the time remaining to complete the balance of less crucial deliverables to a reasonably non-generic standard.

Plan reliability and uncertainty

Our acceptance of the previous explanation of precedence in deliverables production and perceived accuracy of the programme relies heavily upon the assumption that methods utilised *do* result in a reliable plan. As previously identified, among the contractor's personnel, only the office-based planners believed that client-stipulated programme periods are consistently achievable and that 'failure tends to be due to external factors', e.g. exceptionally inclement weather, unforeseen design or procurement delays, etc. However, perhaps their objectivity may be questioned when they all also admitted there could be significant reluctance by upper management to extend programme periods where they had so recommended and also confirmed experience of internal organisational pressure to comply with clients' proposed timescales to maintain a commercially competitive bid. The site-based planners held a more pragmatic view of plan reliability,

suggesting this varied with the type of work and level of detailed information available. By further contrast, the project managers all held high confidence in the reliability of the planned programme, but revealingly (with reference to their reported desire for autonomy and inherent mistrust within many literature sources) only if they had produced it themselves! All interviewees reported a similar approach to dealing with programme uncertainties due to deficient source information, consisting of planning to the level of information available, then 'filling in the gaps with expectations based upon previous experience' together with time contingency allowances and qualification of assumptions if necessary.

Although the literature search revealed a large disparity in agreement regarding optimum programme detail level, within this study a high level of detail was consistently linked with a perception of increased programme reliability by all six planners. While interviewees acknowledged that time and information constraints may limit long-term relevance, detailed planning at this stage is not viewed as wasteful by planners but rather as an essential act in attempting to ensure short-term robust reliability and confidence in the plan. Sufficient detail to assess the design and procurement periods of work packages, satisfy resource identification needs and quantify time-related preliminary costs are other key considerations together with the occasional need to demonstrate (or perhaps even justify) non-compliance with the client's stated duration. These views are based upon a belief that reliable summary after detail is feasible but that summary prior to detail is generally not. However, both the client and construction project managers held with a low detail level, not to reduce inefficiency, but rather for the ability to identify key milestones more easily.

Preconstruction to construction programme development

Although many interviewees confirmed a preferred company policy to engage their proposed onsite construction team, including the planner, at the preconstruction bid stage in response to increasing client demands to identify project personnel prior to bid award and to attempt to maintain continuity of knowledge into the construction phase, this continues to be the exception except in large-scale projects. Instead, a successful bid is normally conveyed from the office-based team to the proposed site team by means of a handover procedure. Perhaps somewhat unexpectedly, it is the office-based planners who find this process most unsatisfactory, one planner declaring that the proposed site team tends to be reticent in requesting a full explanation of the programme and methods, resulting in his speculation that they typically would 'much rather make their own mistakes in private'.

Curiously, the contractor's project managers and site planners believed that the handover process and initial project launch were normally carried out in a reasonable manner, but admitted they were typically more concerned at this juncture with what they considered to be frequently inadequate mobilisation periods prior to commencement on site, with one site planner complaining that 'contractors are pulled both ways'. Project manager review, and changes instigated to the programme prior to final issue as the contractual master construction programme, were therefore usually limited to an appraisal of the current state of design release and overseeing expansion in the detail of those programme activities (e.g. mechanical and electrical services) often summarised at first planning stage. Two of the three office-based planners interviewed also confirmed the widespread practice of producing a shorter duration, non-contractual target construction programme for internal use only, claiming this was most often done in practice not to complete the project earlier, but instead to manage anticipated activity slippage to achieve the original master programme duration. If correct, this revelation again appears to somewhat question the office planners' earlier confidence in the reliability of their contractually agreed timescales.

Despite often being largely responsible for determining the effective project duration from the outset, the client's project manager confirmed that once submitted, the contractor's proposed master programme would not normally undergo a vetting process to assess its accuracy or achievability and he would instead rely solely upon the professional aptitude of the contractor not deliberately to commit himself contractually to an obviously unworkable activity sequence or an unachievable programme timescale.

Predictive models

The potential use of predictive models to estimate project duration was not initially familiar to *any* of the study interviewees and neither were they aware of any corporate attempts at such a system, indicating that the theory is either in its extreme infancy (although, as the NEDO study was published some 18 years ago, this appears unlikely) or alternatively, has perhaps lacked sufficient publicity and exposure to many industry professionals to date. Regardless, once the researchers had explained the concept together with providing examples of current models, the reaction of the interviewees was almost immediately polarised in every case. All planners, without exception, expressed extreme scepticism and lack of confidence in such a

proposal, questioning a direct correlation between individual building durations and suggesting that a large number of project-specific variables rendered an automated system impractical to implement. Conversely, the contractor's project managers (although again originally unfamiliar with the concept) were entirely receptive to the notion, comparing it to today's universally accepted cost planning rule of thumb indicators (such as cost per m^2) and in the absence of a detailed assessment, believing it to be a useful exercise from which to derive an initial duration.

Such was the strength of their initial negative response, the researchers felt it necessary to ask planners to describe their approach to assessing the duration of a project from information so limited as to preclude the production of a detailed programme. Their response was simply to assess the duration based upon their own knowledge of previous similar projects, thus stressing the irony of their blanket rejection of *an entire database* utilising this very concept. The client's project manager expressed both enthusiasm for a predictive model and great surprise that a database of project performance was not routinely used by contractors for this specific purpose. Considering the evidently self-protective reaction of planners, the client's project manager compared it to 'asking an artist to simply paint a wall—it involves taking too much of a broad brush approach!'

All interviewees believed 4D (3D+time) modelling to be a potentially useful exercise (particularly to aid comprehension of complex buildings), although previous experience was limited to clash detection and marketing roles rather than use in an explicit planning scenario. As within literature, some questioned cost, set-up time and whether sufficient detail could truly be incorporated to be effective, but benefits are predicted; as one site planner opined, 'surprisingly, a lot of our project managers cannot picture 2D drawings in 3D'.

Analysis

The key findings and most revealing areas of the research relate specifically to the differing perceptions of first planning and contrasting views upon methods of plan formulation held by each of the four main participants involved in the first planning process. The key comparative responses found in the study include the *site management* focused areas of overall timescale achievability and subcontractor input and the *planning* focused issues of plan detail and receptiveness to predictive model use. To aid identification of each group's contrasting attitudes, the responses are tabulated in Table 4.

The head office-based preconstruction planners expressed high confidence in the reliability of stipulated timescales, a reluctance to involve subcontractors in planning, a preference for a high detail level in programmes and low confidence in the potential use of predictive models. Paradoxically, the contractor's construction project managers expressed low confidence in the reliability of stipulated timescales, an enthusiasm for involving subcontractors in planning, a preference for a low detail level in programmes and high confidence in the potential use of predictive models. The contractor's site-based planners expressed low confidence in the reliability of stipulated timescales, an enthusiasm to involve subcontractors in planning, a preference for a high detail level in programmes and low confidence in the use of predictive models. Again, in contradiction, the client-employed project manager expressed high confidence in the reliability of stipulated timescales, a reluctance to involve subcontractors in planning, a preference for a low detail level in programmes and high confidence in the use of predictive models.

Planners rely upon a high level of programme detail to ensure plan reliability and to fulfil various commercial and financial purposes. The optimum level of planning detail appears less associated with the quest for efficiency reported by many literature sources and is instead dictated by functional necessity, while conversely the site project manager's desire for operational autonomy and flexible progress reporting logically favours a low level of detail. The contractor's project managers and site-based planners in this study appear to hold serious reservations regarding the achievability of many project durations with which they are

Table 4 Summary of key comparative responses from each individual role

Role and no. of interviewees	Site management focus		Planning focus	
	Stipulated timescale accurate?	Subcontract input to planning?	High programme detail level?	Predictive model use?
Office-based preconstruction planners (3N°)	**Yes**	No	**Yes**	No
Site-based construction planners (3N°)	No	**Yes**	**Yes**	No
Site-based project managers (3N°)	No	**Yes**	No	**Yes**
Client's project manager (1N°)	**Yes**	No	No	**Yes**

charged—even prior to embarking upon construction on site. Commercial pressure to accept demanding timescales notwithstanding, this raises serious concerns regarding the commitment to and ownership of the project master construction programme by site-based personnel and possibly also questions the realism of the office-based preconstruction planners and senior management by whom the initial duration of most projects are predominantly vetted and approved respectively.

Perhaps the most striking aspect suggested by the study is the complete disagreement between the contractor's site-based project managers and office-based preconstruction planners on each of the four key points identified. This may conceivably be due to their differing professional priorities and perspectives; the project manager regarding planning as an imprecise, secondary role and one of many concerns in a time-constrained environment; therefore he demands increased flexibility, delegation of planning to subcontractors and summary level decision making. Conversely, the specialist office-based planner understandably regards planning as his primary role, necessitating precision, with highly detailed rigidly controlled plans. If this explanation of differing philosophical approach is correct, it could also conceivably elucidate the planners' lack of enthusiasm for predictive models and apparent refusal to accept a non-bespoke, outline process, while all project managers interviewed responded favourably to the predictive model concept and expressed a strong preference for summary level planning.

The study revealed a consistent lack of enthusiasm among all planners interviewed to engage the contractor's project manager in the first planning process, followed by dissatisfaction among office-based planners with procedures used when entrusting their successful bid with the site team. Their justification of these views appears to relate to an alleged workload-driven lack of commitment and motivation from contractors' site-based project managers during the first planning stage and a perceived reluctance by the site team to fully acknowledge the first planning of the successful bid carried out by the original office-based planner respectively. Again, as suggested by existing literature, these grievances appear to relate to non-involvement (first through lack of time and later, conceivably through a desire for planning autonomy) of site-based project managers.

Conclusion

There appears to be a clear divergence in both literature sources and industry practice regarding the perceived need for accurate first plans which 'prove' the construction period including evaluation of the risks and costs associated with it, and the perceived poor performance of first plans and subsequent need for planning methods which use them only for strategic planning and provide tactical planning which acknowledges the uncertainty inherent in the process of construction.

What this research indicates is that, if this sample is representative, one of the major factors preventing more successful project planning is the differing approaches of those who produce first plans and those who deliver the project. They simply see the problem from different points of view and unless the industry can find ways to develop some convergence of these views while also facilitating macro receptivity to more realistic construction durations, there is a possibility that we will continue to be unsuccessful in planning our projects.

We believe that there is reluctance in the industry to accept that first plans and later plans can have a degree of separation and that their purposes are different. The linking of these plans in a 'push'-based manner has long been argued against within the lean construction research community but, based upon the study data obtained, this message does not appear to have penetrated to practitioner level. Further research into how to overcome this cultural and motivational difficulty is needed.

In addition we think that the potential difficulties associated with producing accurate first plans at a time when the project is often not even fully designed mean that material quantities and interfaces are typically unclear and therefore even if the time and skills are available it may be a wasteful exercise and instead the increased promotion and use of predictive models should be encouraged.

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