

## **BEST PRACTICE FOR MULTI-PROJECT MANAGEMENT IN THE CONSTRUCTION INDUSTRY**

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### **ABSTRACT**

The current demand for higher quality of living and greater technological development has meant that large construction projects are increasing in number and complexity year by year. Many complexities have been highlighted in managing multi-projects. Over the past 10 years, multi-project management (MPM), or programme management, has been recognised by many authors as an appropriate approach to managing multiple projects. However, results from the first stage of the research done by the author reveals that this approach is not popular among professionals in the UK construction industry. The lack of comprehensive guidelines for managing multi-projects in the construction industry has contributed to this situation.

This paper aims to illustrate the key elements and associated best practice in managing multi-projects (M-Ps) in construction. It begins with the brief description of the research, a definition of multi-project management, a description of some of the problems encountered in managing M-Ps, and opinions of various authors on how to mitigate some of these problems. The second part of the paper describes the MPM approach, the key elements and associated best practice for both preliminary and implementation stages. The adoption of this best practice would help to ensure successful delivery of M-Ps.

*Keywords: Multi-project management, key elements, best practice*

### **1.0 BRIEF DESCRIPTION OF RESEARCH**

The author has been involved in this research since April, 1997. The research aims to establish best practice in managing multi-projects in construction. After a comprehensive literature review, a postal survey of 155 construction practitioners was conducted and finally, detailed interviews with various project management consultants were conducted to test the propositions made about best practice. The postal survey aimed to confirm the definition of MPM and to investigate the extent of MPM implementation in the UK construction industry. It also reinforced the need for further research to establish what are the key elements of best practice for MPM in construction.

### **2.0 MPM APPROACH**

## 2.1 MPM Definition

There are various definitions of MPM or programme management but the findings from the first stage of this research showed general agreement on the following definition:

*The management of a set of projects which are related directly or indirectly by their clients, business objectives, financing, resources, environment or operation.*

From the survey, the main criteria for selecting projects for a Multi-Project (M-P) portfolio were identified as follows:

- they have shared objectives or the projects address a common problem;
- they have a shared common purpose in support of the strategic aims of the business;
- they have shared resources that can be optimised by co-ordination across projects;
- they have interdependencies or closely related technical interfaces.

## 2.2 Problems in managing M-Ps

Managing in a complex M-P environment is not an easy task. Payne, (1995) states that a M-P “*lies at the intersection between two different worlds, external and internal, with often conflicting expectations of the projects, different expertise and knowledge, or even different views on the criteria for a successful project*”. This complexity often demands that work be done with a high level of interdependency between the multi-project team. The integration of such a variety of expertise, and the various interests of many stakeholders, into working towards the project’s objectives can prove difficult.

Traditional project management has concentrated on scoping, planning, management and control. It aims to deliver well defined tangibles or deliverables within specified parameters of cost, time and quality (Turner, 1993; Becker, 1997). In MPM, however, while each project will retain its own scope and goals, all teams are tuned into the overall “M-P’s goal”. This M-P goal is what the M-P manager, and the projects’ teams strive to achieve, given specific time constraints and a set of anticipated benefits (CCTA, 1996; Bradley, 1997).

Other problems associated with managing M-Ps include difficulties in:

- obtaining attention from senior management (Olford, 1994; Levene & Bragnza, 1996);
- establishing precise definition of the M-P (Eskerod, 1996; Olford, 1994);
- managing resources (Olford, 1994; Payne, 1995; and Eskerod, 1996);
- establishing a good scheduling system (Olford, 1994; Payne, 1995; Baccarini, 1996);
- setting up the management structure suited for MPM (Smith & Wearne, 1995);
- managing risk (Eskerod, 1996; CCTA, 1996);
- providing efficient communication and co-ordination (Olford, 1994);

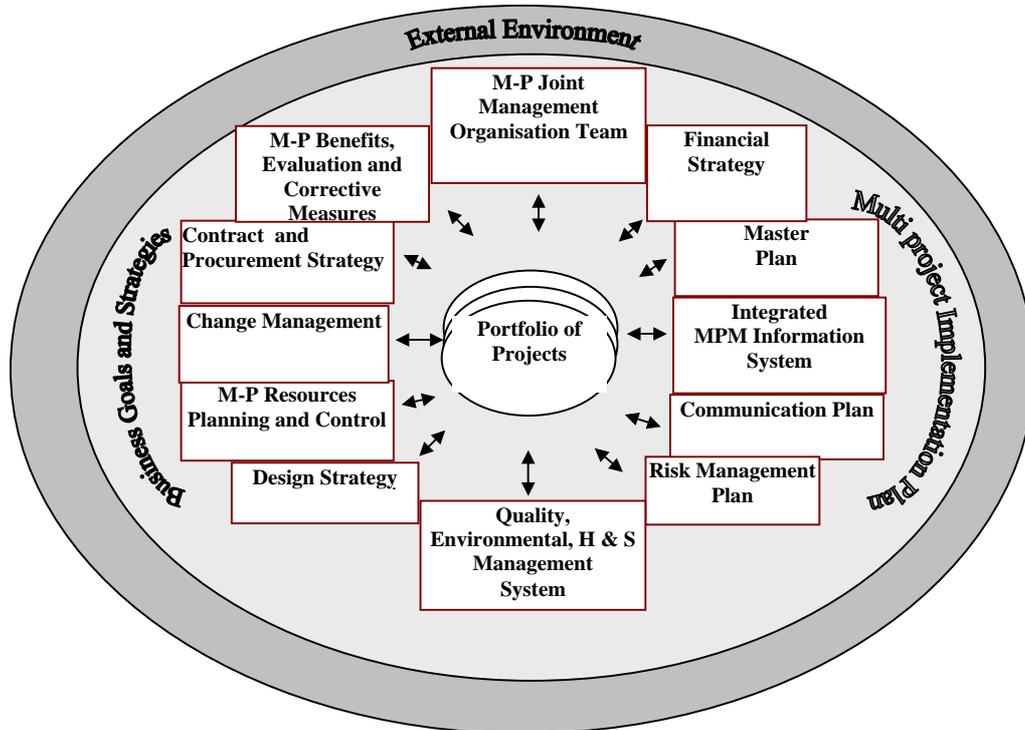
## 2.3 The MPM Approach

Most of the research on MPM published over the past ten years comes from the manufacturing, retail and communication sectors. Many authors agree that the various problems noted above could be alleviated by taking a structured MPM approach. Their views form the basis for a conceptual MPM framework and identification of key elements that need to be considered during the preliminary and implementation stages of a M-P (see figure 1).

MPM can be viewed at three levels, i.e. business strategy level, M-P level and project level. The outer circle of Figure 1 reflects the external environment factors (political, technological development, and customer demand) that influence the formation of an organisation’s

business strategy, represented by the second circle. M-Ps are then identified, and goals are set, to support the overall business strategy.

Once the senior management has given their support, the M-P goals and strategies are further defined through the establishment of a M-P brief. The second circle in Figure 1 show 13 elements that need to be considered in the early stages of MPM and the third circle shows portfolio of projects within the M-P.



**Figure 1: MPM Conceptual Framework**

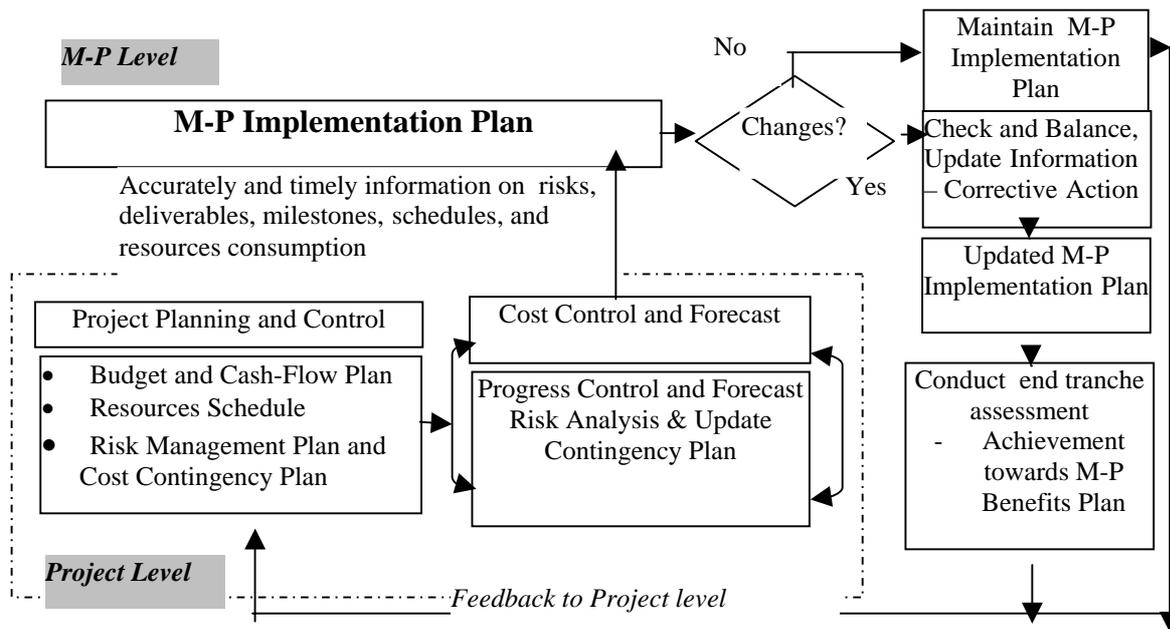
The 13 elements are: M-P goals and strategy; MPM Organisation; Master Plan for M-P; Integrated MPM Information System; Communication Plan; Financial Strategy; Risk Management Plan; Quality, Environmental, Health and Safety Management Systems; Design Strategy; M-P Planning and Control; Change Management; Contract and Procurement Strategy; and M-P Benefits Plan, Evaluation and Corrective Measures.

These elements cover all aspects of MPM and have been adapted for use in the construction industry. For example, elements such as the Master Plan, the Environmental, Health and Safety Management System, the Design Strategy, and the Contract and Procurement Strategy have been added as a consequence of the responses obtained from the postal surveys and interviews.

The key elements and associated best practice described in section three need to be developed to form a M-P Implementation Plan, which then represents a set of guidelines for executing all the component projects of the M-P.

The relationships between all the elements are shown in Figure 2. For example, after each tranche, the project manager of each individual project must provide accurate information on the progress related to design, finance, risk, quality, environmental, health and safety issues,

contracts and procurement strategy. Any changes have to be evaluated and the impact of changes on milestones, schedules, and resource consumption for the project under his/her control is reported to the M-P manager. The M-P manager then checks the progress of the project against the M-P Implementation Plan. Changes to all projects within the portfolio have to be evaluated and weighed against each other in the context of the M-P, and corrective measures should then be taken to ensure that all projects together meet the overall objectives of the M-P Implementation Plan. The updated information must then be disseminated to all parties in the M-P to ensure that they are also aware of the changes. At the end of each tranche, the M-P manager should check the achievements of the M-P against the benefits plan established earlier.



**Figure 2: M-P Planning and Control Process**

### 3.0 MPM ELEMENTS AND ASSOCIATED BEST PRACTICE

The following MPM elements and associated issues result from an extensive literature review and interviews with informed practitioners conducted during the early stages of the research. They are suggestions for best practices, which were later tested in the postal surveys and in-depth interviews.

#### 3.1 M-P goals and strategy

As when managing a single project, a M-P also needs proper multi-project goals and strategies to accurately define the M-P. This idea is supported by many authors, including Turner & Cochrane, (1993); Olfard, (1994); Strange, (1995); Levene & Braganza, (1996); CCTA, (1996); and Pellegrenelli, (1997).

Defining and developing the client's requirements must be established through careful planning and forethought. The key issues to be addressed include an early identification of all MPM roles and responsibilities, the need for any specialists, the benefits of the M-P, the major risks, any requirements for support services, required resources, potential sources of

funding, and an outline business case. The outcome of this initial exercise is the M-P brief to be used by all the MPM team as a reference in developing the M-P.

### **3.2 MPM Organisation**

The nature of projects in the construction industry is such the involvement of many organisations to provide a variety of skills, expertise and services is required. The client, consultants, contractors and specialists should all be represented on the joint management team. The leader must have excellent leadership qualities, and the allocation of power and responsibility needs to be established to facilitate a team building process. Plans and objectives of the M-P should be prepared by, and available to, all major parties involved.

Cultural change in any organisation needs senior management support. Knutson, (1994); Olford, (1994); Scheinberg et.al., (1994); CCTA, (1996) and Gray, (1997) agree that senior management play a vital role in ensuring success of a M-P. They should recognise the scope of work and the need for resources, and ensure that all projects within the M-P meet the corporate objectives.

### **3.3 Master Plan for the M-P**

A master plan is considered important for complex or large M-Ps when they are developed on one site. The master plan needs to reflect the policies and aspirations of the client, taking into account site constraints, an integrated transport strategy and a utilities strategy (AMEC, 1996). Landowners/developers and their design teams must be consulted throughout the M-P life-cycle to ensure that their proposals are developed in accordance with the design parameters set out in the master plan (Summerhill, 1999). Each project in the master plan must blend with surrounding facilities/buildings and their infrastructure in terms of function, articulation of space and aesthetics.

### **3.4 Integrated MPM Information System**

An integrated MPM Information System is important for effectively managing M-P programmes and any changes in the M-P. The key issues include obtaining commitment from all the parties involved to distribute information as required, and standardising systems used by all the parties for an effective flow of information (Parry, 1998). Work schedules, together with costs, financial schedules and funding milestones, need to be integrated and multi-level coding conventions need to be used to organise the order in which the activities are stored in the database (Parry, 1998).

### **3.5 Communication Plan**

Effective communication is a central factor in leading people and integrating them into an organisation. A highly developed and integrated information and communication system is essential for effective MPM (Laufer et.al., 1996; CCTA, 1996).

In developing the communication plan, robust and inquisitive lines of communication between the client, or client's advocate, and the M-P team must be established (CCTA, 1996). An appropriate way of communicating to each must be selected, taking advantage of modern communications technology such as e-mail and network systems where appropriate. The systems must be integrated with the client's for ease of reporting (Parry, 1998). Other key issues include identification of the frequency of meetings, objectives of meetings and what is to be achieved from them (Summerhill, 1999). Communication plans must be executed and monitored, and comments and suggestions from participants must be welcomed for process improvement (Olford, 1994; Knutson, 1994; Baccarani, 1996; Laufer et.al., 1996; CCTA, 1996; Pellegrenelli, 1997).

### **3.6 Financial Strategy**

The key issues here include establishing links with potential sponsors (either private or public agencies), understanding their requirements, setting out the financial implications of the M-P in capital and revenue terms (Stanion, 1997 and MCC, 1996), assessing the M-P risks, and monitoring their implications for the financial plan (Stanion, 1998). Contingency must be provided to allow for cost overruns and delays in the M-P (Schmistrz, 1998).

### **3.7 Risk Management Plan**

As with managing a single project, the management of risk is important in MPM. Risks and uncertainties of all projects must be identified, estimated and evaluated by a risk specialist in the early stages, and later managed by the M-P manager .

Risk management needs to be integrated into the whole spectrum of factors affecting the M-P, including environmental aspects, political aspects, quality, safety, finance, and M-P interdependencies (Stanion, 1998; Boothman, 1997). A risk register, some classification of the risks, the mitigation measures necessary, and risk ownership must be established, together with plans for risk monitoring and control.

Risk management will need to be done continuously throughout the M-P. Risk management logically follows risk analysis, though, as with analysis, the two phases may overlap (CCTA, 1996; Sandvold, 1998).

### **3.8 Quality, Environmental, Health and Safety Management Systems**

These systems must be adapted, integrated and used in ways appropriate to the M-P. According to Summerhill, (1999), these systems must be established and the standards set to be adhered to by all participants and applied to all aspects of MPM, including M-P organisation, roles and responsibilities, design management, change management, inspection and test plans, documentation requirements, and planning and control procedures. The tools and techniques, as well as the methodologies to be employed, also have to be identified and demonstrated.

### **3.9 Design Strategy**

The key issues in designing M-Ps include an understanding of the stakeholders' requirements, the M-P goal and strategies, and the M-P brief (Stanion, 1997). The M-P manager needs to assist the client and the design teams in developing individual project briefs and project business cases, ensuring that the M-P requirements are complied with.

Other key issues include the establishment of procedures and processes to manage design from the preliminary stages through to completion. Milestones for each stage of the design must be set, incorporating when consents and permits of the projects need to be obtained, and when funding is approved. Good management tools such as value management should be used for the whole process of design to ensure that the best value for money is achieved in the design (Stanion, 1997).

Legal requirements, information and data must also be established before embarking on the design of individual projects within the M-P (Stanion, 1997; Boothman, 1997; Robinson, 1998). This is important to avoid future conflicts between developers or individual site owners.

Infrastructure layout, technical and functional design, space articulation between projects, similarity of materials to be used, and composition of colours all need to be considered in order to enhance the whole development (Stanion, 1998).

To ensure constructability of complex projects, construction specialists need to be brought in early during the conceptual phase of the M-P to avoid delay in the design process (Stanion, 1997 and MCC, 1996). This is important to ensure that the correct time and costs are estimated and to help avoid delays.

The M-P brief and individual project briefs should be frozen, or at least changes in design should be minimised, once the design scheme of an individual project has been approved. This is also important to avoid delays.

Shiplee, (1998) and Summerhill, (1999) highlight the importance of change management in M-P. Change control procedures for design must be established within the quality system. Changes in design must be communicated to the relevant parties and it must be ensured that immediate corrective actions are taken to rectify problems.

### **3.10 M-P Planning and Control**

To reduce the complexity in M-P, projects need to be prioritised (Van Der Merwe, 1997; CCTA, 1996; Cagno et., al. 1998) and the sequence of projects and their interdependencies must also be established (CCTA, 1996). Time-scales, costs and resource needs for each project must be obtained from project team members. The M-P needs to be broken down, in terms of both cost and duration, into 'manageable chunks' at appropriate levels (CCTA, 1996; Parry, 1998). This becomes the master programme for the implementation of the M-P.

The structure of the M-P, a route map, key stages and milestones of activities, as well as visible end deliverables must be shown clearly in the programme (Schmitz, 1998). At project level, these elements are broken down into more detail.

The project manager for each project must report status and variances to the M-P manager (Tørsleff, 1998). This information is used by the M-P manager to consolidate, analyse and monitor resource consumption, interfaces and dependencies during the life of the M-P (CCTA, 1996; Cagno et. al., 1998). The M-P implementation plan must also be maintained to reflect contract variations and works schedule revisions as they are approved (Schmitz, 1998).

### **3.11 Change Management**

Change control procedures for resources must be established. Information, in terms of time-scale, cost, equipment, and human resources, must be obtained regularly for each project (CCTA, 1996). Any changes must be reported to M-P manager. The M-P manager should analyse the impact of changes on the M-P Implementation Plan in terms of design, time-scale and resources plan, and then check and balance those resources in the master programme and take corrective action as necessary (Scheinberg, & Stretton, 1994; CCTA, 1996; Shiplee, 1998). All change requests and outcomes must be monitored and recorded regularly (Summerhill, 1999).

### **3.12 Contract and Procurement Strategy**

Complex projects such as in the M-P environment influence the choice of contract and procurement strategy. Wozniak (1993) and Baccarini, (1996) suggest that systems for managing complex projects are becoming more interdependent, with greater cross-impacts

between elements of the projects, and thus between the activities. This consequently may have an effect on time, cost and quality (Gidado, 1996). Failure to recognise the interaction between the contracting strategy and the project's risks and capital costs will place that venture at a competitive disadvantage (Hetland & Fevang, 1997).

Key issues in contract strategy include the choice of contract, which should be rationalised against client objectives, the nature of client, the size and complexity of the M-P, and the prevailing market conditions (Boothman, 1997; Stanion, 1997). Innovative contractual arrangements (for example strategic alliances or partnering) should be accepted if real benefits can be demonstrated (Hetland & Fevang, 1997; MCC, 1996). Quality assurance, risk allocation and interface between contracts must also be built into contract documents (Schmitz, 1998).

Key issues in procurement strategy include understanding project needs early in the M-P and prioritising them (Knutson, 1994 and CCTA, 1996); identifying the source of resources early, for example where to procure materials and equipment, as well as considering the possibility of utilising local resources (Boothman, 1997). Mechanisms (incentives and penalties) need to be developed to ensure precise schedules of delivery from suppliers (Boothman, 1997) and ensure that long lag equipment and facilities are pre-ordered well in advance (Stanion, 1997). Shiplee (1998) added that the potential for bulk purchase of materials also needs to be considered for all projects in a M-P.

### **3.13 M-P Benefits Plan, Evaluation and Corrective Measures**

CCTA (1996) and Bradley (1997) emphasised the importance of establishing a M-P Benefits plan early in the definition stage of a M-P. CCTA suggest that the benefits plan should include targeted costs, time, quality, client satisfaction in meeting business strategies, value for money, effectiveness of change control procedures, co-ordination with infrastructure planning, management of interdependencies, resources management, performance of third parties, and effectiveness of risk management plans and procedures.

Key issues in this element include identification and establishment of MPM benefits as a measure of performance, and to establish roles and responsibilities for benefits realisation (CCTA, 1996). Regular measurement of performance and progress needs to be conducted at the end of each 'tranche' of the M-P (CCTA, 1996; Bradley, 1997). Problem areas must be identified, and deficiencies and deviations checked and discussed with M-P team members, who may then suggest corrective actions (Cagno et.al., 1998). The M-P manager is also responsible for ensuring that the respective parties have implemented the required corrective actions. Finally, the benefits must be audited at the end of the M-P and documented as a close-out report for future reference.

## **4.0 CONCLUSION**

Best practice in MPM for the construction industry has not yet been documented. However, the proposed elements and associated issues outlined above are an important step towards establishment of best practice. The propositions that have been developed from the extensive literature review and discussions with many practitioners in the early stage of this research will form the basis of the next stage of the research. It is believed that this practice will have a significant impact on realising maximum benefit from MPM.

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