DESIGN MANAGEMENT IN A DESIGN-CONSTRUCT ORGANIZATION

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As clients have become more aware and demanding of the construction industry, they are also less tolerant of the management of its problems and the risks involved in the delivery of major projects. Identification and allocation of risk is one of the most critical processes in the early stages of project development. Often it is the deciding factor in the selection of the building process and of the type of procurement method adopted to manage the various project risks. The emergence of different forms of procurement, and in particular, design-construct and novation, requires the design-construct contractor to not only accept the risks associated with the construction of the works, but also of the design management during the design development of the project. With the increasing requirement for design-construct contractors to balance the cost management issues and design development through the various stages, the role of the design manager as information manager has evolved and expanded in importance. This paper presents a case study of design management within a design-construct organization on a large residential apartment project. It identifies and analyses issues concerned with the organization, responsibilities, relationships and stages of development in a typical design-construct project.

Keywords: design, design construct, design management, procurement, risk.

INTRODUCTION

The construction industry is a complex, responsive and volatile one, with its very essence based on one-off projects and temporary relationships. It is to be expected that it carries with it a multitude of complaints and problems. The fragmentation of the industry is exacerbated through the separation of the professions, design from construction and the uniqueness of projects and the ephemeral nature of the relationships and project organization (Masterman, 2002). Furthermore, the culture of projects is characterised by a high degree of differentiation. A project team comprises of a number of, usually small, groups of independent and specialised professionals all working in different locations, on specialised tasks that are all interdependent (Rowlinson and McDermott, 1999).

This problem of differentiation and specialization not only exists in the project relationships, but also in the project process. A source of criticism is the obvious

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divorce of the design and construction processes and the move to marry the two can be seen as the aim of the change in procurement methods (Knight, *et al.*, 2002). A necessary pre-requisite in the separation of design and construction, and the specialization of the project contributors is the absolute necessity for rigorous management of the process whatever the chosen procurement method (Rowlinson and McDermott, 1999).

There have been a number of notable reports published in the 1990s that have identified the plight of the construction industry. Latham (1994) and Egan (1998) from the UK and in Australia the recent Australian Construction Industry Action Agenda, *Building for Growth*, (DISR, 1999) addressed problems in the construction industry and areas where reform is required. Common threads of these reports are issues relating to the inefficiencies of traditional procurement methods. The Comptroller and Auditor General (2001) also addressed the need to improve the integration and focus on the construction process and on meeting the needs of the end user. Table 1 combines the key performance indicators and recommendations of Egan (1998) with parallel key initiatives identified in *Building for Growth* (1999).

In Australia, the Australian Procurement and Construction Council Incorporated (APCC) published the National Code of Practice for the Construction Industry in 1997. The Code represented the expressed principles that governments, Commonwealth, State and Territory, agreed should "underpin the future development of the construction industry in Australia". The principles are aimed at ensuring the industry is client-focused, builds better business relationships, ethical competitive behaviour, strives for continuous improvement and best practice, workplace reform, improved occupational health safety and rehabilitation (OHS&R) and industrial relations management. The notion of continuous improvement and best practice is of particular interest and is described as being a commitment to "effective organizational systems, exceptional people management policies and practices and superior time, cost and quality outcomes" (APCC, 1997). All of these aims should form the basis for defining the design management process.

Table 1: Key drivers for change in the Construction Industry.

The Egan Report (1998)		**Building for Growth (1999)**
Key Drivers	**The Recommendations**	**Key Initiatives**
Committed Leadership	Teamwork between all parities and the elimination of confrontation	Information Technology and International Market Development
A focus on the customer	Provide the end customer their precise needs and at a price that reflects the product's value	Business Improvements
Integrated processes and teams	For all project members to work as a team, be involved at the earliest possible stage and eliminate competitive tendering	Networks and Alliances
A quality-driven agenda	A subjective issue, but should include aiming for getting right first time, every time and exceeding customer expectations	The Environment
A commitment to People	No-blame culture of mutual independence, trust and respect, an environment of sustained improvement and commitment to training.	Innovation and Regulatory Reform

THE SHIFT IN PROCUREMENT METHODS

The choice of a procurement method is probably the single most important decision the client makes other than the decision to build. The various procurement methods can be described, as defined by Masterman (2002), fewer than three distinct categories:

- separated and co operative;
- integrated; and
- management orientated.

The shift that has occurred over the recent decades has been away from the conventional methods characterised by separated design and construction processes (1) and toward both integrated and management style structures (2 and 3). This change has been largely client driven, as these alternative systems require the contractor to accept a high degree of risk associated with the design development and construction of the project.

> *'Design and Build and its variations have expanded considerably in the last decade. It has increased dramatically in the 1990's going from a 10% share during the 1980's up to a 35% share of the construction procurement market, with management contracting declining to a 10% share'*
>
> *(RICS, 2000).*

Design and build

The original design and construct method of building procurement had the client enter in a single contract with one organization that integrated the design and construction process to promote speed, economy of building and non-adversarial relationships (Gregersen, 1998). The design and construct company often utilised an "in house" design team or they contracted externally. There are various types of design build arrangements and Akintoye (1994) has identified six categories:

1. traditional (or pure) design and build;
2. package deal;
3. design and manage;
4. design, manage and construct;
5. novation, and
6. develop and construct.

However, it is common practice today that the architect is initially appointed to deliver the brief and schematic design and then replaced with a design and construct contractor led by a project or construction manager. This is commonly called *novation* contracts.

> *'Novation is essentially the cancellation of one contract (i.e. the creation of a consultancy agreement between the client and designer) and the creation of a new contract (i.e. the same consultancy agreement, but between the builder and designer.'*
> *Weatherall, 2000.*

One example is after the brief an appointed design team establishes initial schematic design, the project may be tendered or negotiated on limited documentation and a contractor then appointed. The architect, as well as other specialist design consultants such as structural and services engineers, are contractually transferred by *novation* to the contractor to design, develop and document the project. The system has its

benefits in the integration of design and construction and the early involvement of a contractor for their buildability input (Akintoye, 1994 and Knight, *et al.*, 2002).

The design and construct system aids the "fast-tracking" process by integrating the design documentation and construction stages. The issue of concern in this structure is that the design process is likely to be managed by a professional with limited abilities to evaluate quality and assess design decisions (Sullivan and Schwager, 1991). However, one of the disadvantages of the design and construct system is that budget and schedule often prevail whilst quality suffers (Gregersen, 1998). Results from a study in the UK stated that in the opinion of the clients, quality did not suffer (Bengard, 1999). This same study also found that projects using integrated structures often resulted in better value for money and less contractual disputes.

> *'The major advantages of design and build are that all the risks, both financial and period for completion, are transferred to the design and build contractor, with the client only dealing with one organization, so eliminating the complexities and frustrations of dealing with a range of separate organizations. The approach also overcomes the problem of the separation of design and construction, so saving overall time and allowing the design to reflect improved buildability in the construction solution. Obviously, the design and build contractor can ensure that the proposed design solution reflects its own particular expertise and resource availability, in terms of developing the design and construction solution'. (Bengard, 1999).*

The need for a design manager

The developments in the construction industry, the continuing specialization of professions and the rising application of alternative procurement methods have all contributed to the gap between design and management, but they have also emphasised the need for a design professional with management and technological skills. The management of the process should ensure a successful and deliverable project (Allinson, 1997).

Design management plays a critical role in commercial development projects sponsored by a developer or developer/contractor. The need to be able to balance time, cost and quality constraints within a value framework is a crucial skill for the successful project or design manager. A case study of a commercial project by a developer/contractor is presented to illustrate the role for a newly created design manager and the linkage between this role and to the existing project and cost managers.

CASE STUDY

The case study is an apartment development project, focusing on the post feasibility approval stage during the early design development stages in a company referred to as Company A.

A development project at company A

The project is a large-scale private apartment development in the Central Business District of Melbourne, Australia. The project value is approximately $85 million with 450 apartments for eventual sale. The vision and marketing for the project were clear from the outset; affordable, modern, architectural style living appealing to young successful singles and couples without children. The apartments vary in size, but are

predominantly two bedrooms of approximately 70 square metres total apartment area, as well as single bedroom, three bedroom and studio style apartments also available. The focus throughout the feasibility and design process was to maintain the architectural quality whilst maintaining budget compliance, being cost effective as well as retaining valuable features.

The benchmark for quality was outlined at the outset of the project and remained 'the brief' through the early feasibility and budget establishment stages. That is, quality had to be above the market 'budget' standard used by many developers in the market. However, the standard aimed to be below the higher quality, but more expensive market superior standard provided by only a few developers. This presented Company A with an opportunity provided by this perceived 'gap' in the market and that this developer chose to fill. The development proved successful in the marketing with close to 70% of the apartments sold 'off the plan' in the first few days of sale.

Contracts and procurement methods

Company A at any given time has at least a dozen projects running simultaneously between the two largest states of Australia. Currently, there is less than 30% of projects structured under a traditional system where the architect acts as contract administrator and agent to the client and the design is completely developed and documented, tendered and once construction is commenced,. The prevailing method of procurement is a hybrid of conventional and design and construct contracts. Novation and project management procurement arrangements now account for over 65% of the company's projects.

The case study is a typical construction project in Company A and Figure 1 is indicative of the organization of design-construct in this company. The schematic designs were prepared for the client by consultants and included architectural drawings, structural drawings, services operations briefs and initial documentation. Selective tenders were called and upon award of the tender, the design consultants including architect, structural and services engineers were contractually transferred by novation to the management of Company A. It was then the responsibility of the contractor to complete the design, specify and document the project and produce construction drawings.

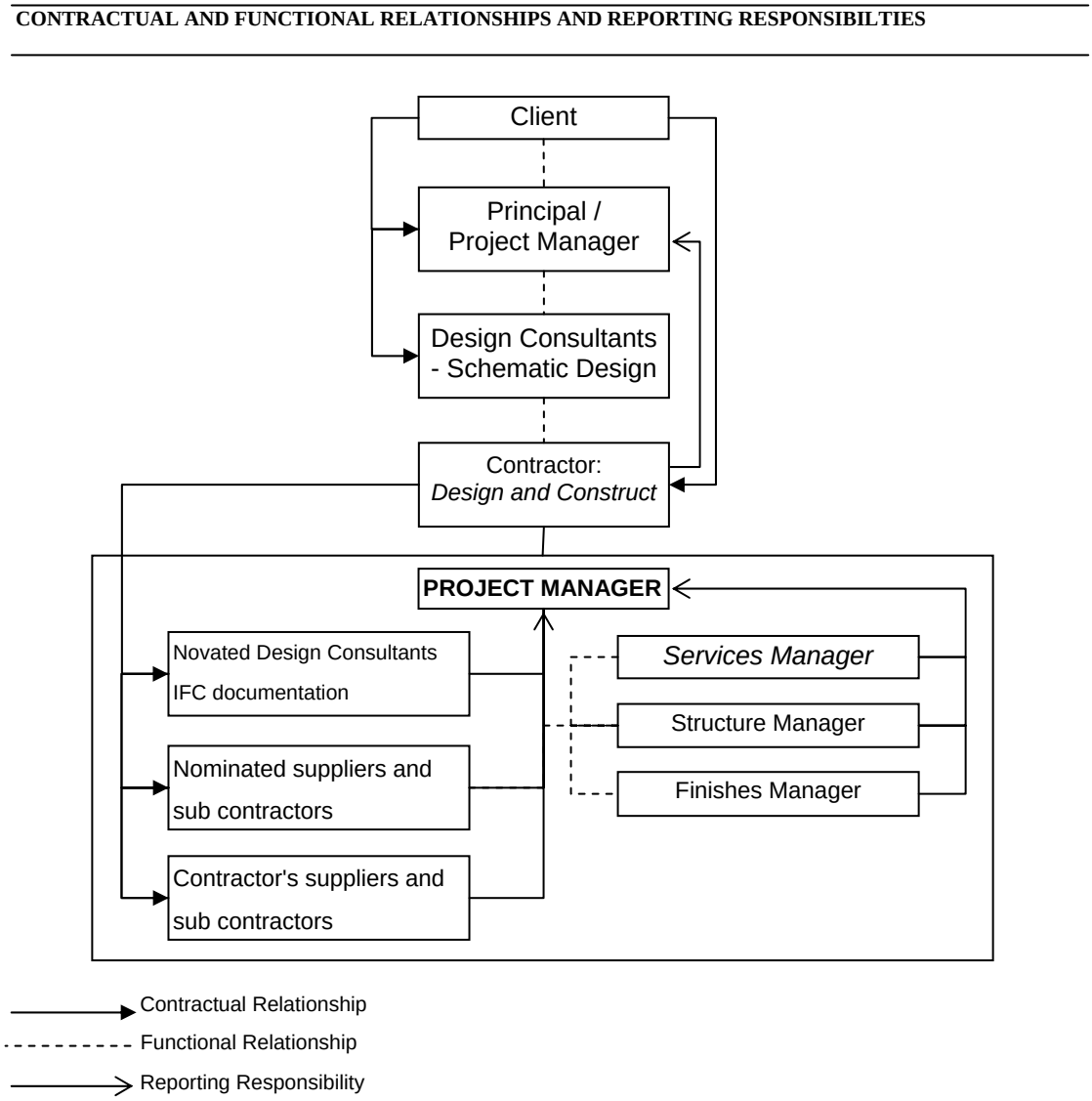
The concern, with this system of procurement is that in most cases the project manager may not realise their limitations in understanding the design process and are too focused on the cost and construction scheduling parameters of the project (Sullivan and Schwager, 1991). It is also likely that they are not able to effectively evaluate quality and make informed design decisions. However, the benefit of this structure is that during the painstaking processes of specifying and documenting the project, the client (via the project manager) has a single source of contact.

Weakness in the company

In the past, the project manager was responsible for all facets of the development and construction of the project including design documentation and construction management. The project manager was assisted by services, structure and finishes managers (refer to Figure 1). However, a single reporting source on all aspects of design and cost has not always benefited the client, contractor or the project. Projects have been organised in a very "flat" structure with numerous lines of responsibility reporting directly to the Project Manager. The larger projects would have over half a dozen separate factions directly beneath the project manager, including the above

stated managers, structure coordinators, documentation managers, tendering coordinators, contract administration, project administration and occupation health safety and rehabilitation (OHS&R). In practice, this structure has proved to be an inefficient and ineffective form of management on many projects.

Figure 1: Typical hybrid organizational structure of projects at company A



With the dominance of design and construct contracts, the management of the design and development of projects is essential to enable successful procurement and fast tracking. However, its weakness is in the management of design and cost during design development and the lack of understanding of how to achieve good design, to the expected quality and within budget parameters. The weakness is aggravated by the perception of the design cost control function as have the single focus on "cost cutting" and not on value implementation.

The project design development manager (PDDM)

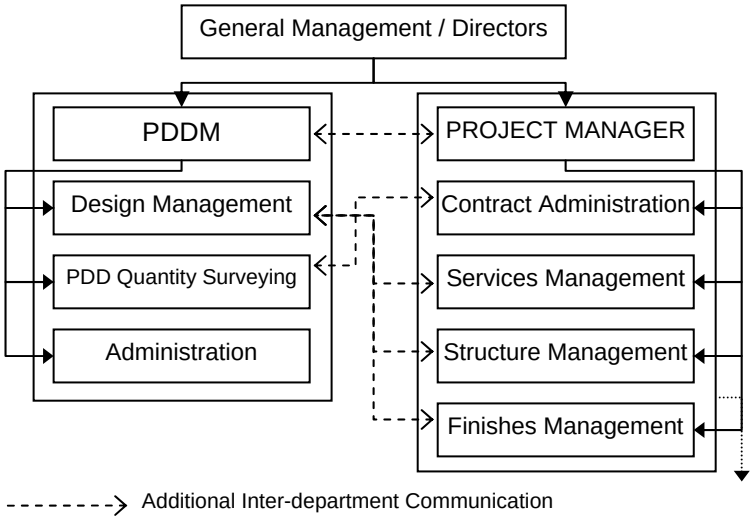
Project A was initially expected to develop over three distinct phases: feasibility, design development and construction. It was realised from the outset that the period of design development would prove the most crucial. The company, already

proficient in the management of construction, was to embark on the management of design and development for the first time.

The role of the PDDM was to lead the design team, manage the design consultants and interact and advise the developer of design decisions. The appointed PDDM was an architect. The structure and organization for the case study project is given in Figure 2.

Figure 2: PDDM structure – Parallel reporting and responsibilities

PROJECT DESIGN DEVELOPMENT MANAGEMENT (PDDM) ORGANIZATION



The project organizational structure in the case study failed to adequately understand and identify reporting responsibilities, define role requirements and most importantly, satisfy budget requirements. The PDDM in this case study created a parallel structure alongside the construction project manager, which led to the diffusing of lines of authority (refer to Figure 3 (a) – (c)).

Collective leadership is more likely to fail in a parallel management structure as it creates confusion and ambiguity in responsibility and authority. Allison (1997) describes the project organization as a web spreading from the central core function of project management. Surrounding the core are the various professional teams, each with their own project management function (see Figure 3a). The outcome of parallel project management, i.e. the project manager and the PDDM, is that each spins their webs. The worst-case scenario may be the two never meet (Figure 3b). However, in the case of this project the two met, overlapped (Figure 3c) and chaos was created.

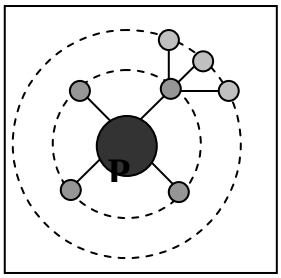


Figure 3(a)
Project management web (Allinson, 1997)

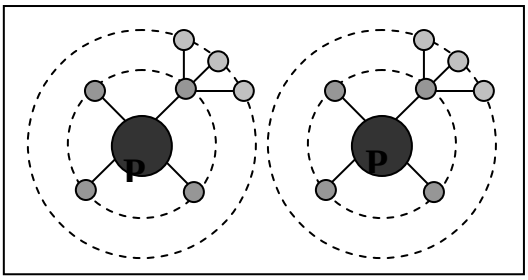


Figure 3(b)
Non-cohesive effect of parallel project management webs

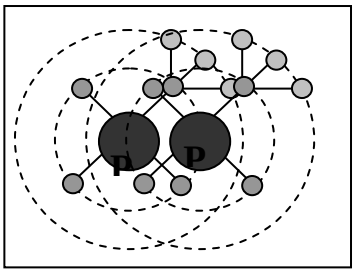


Figure 3(c)
Chaos effect of parallel project management webs

The project was fast-tracking not only the design development and construction, but also faced problems with the establishment and implementation of the new PDDM process. The PDDM structure was successful in the design management aspect of balancing the means and ends, that is, the product of architecture and design with the process of management. The failure, however, was largely due to the parallel management structure that was created and the underlying effect was that while the design was being managed, cost and program were not. It was not until documents were being issued for construction that the project management team was aware of the non-budget compliant status of the design. Whilst a remedial action plan was established in the form of a design cost review process, it was realised that the implementation of a new process would be required to prevent the problem occurring again in the future.

The company's response

The common criteria for measuring and evaluating a project's objectives and performance are known as the triangle of cost, time and quality. It would therefore be suitable to structure the project management team in a similar model: project manager (all factors and especially time), design cost manager (cost) and design manager (quality). See Figure 4 for the company's response to managing these three key areas. To maintain the necessary single source of responsibility, the overall leadership would be maintained by the project manager, assisted by a design cost manager and design manager.

The Project Manager's (PM) role remains as being involved in all facets of the project, particularly relating to programming (time), construction and personnel issues during the design development process. The design manager (DM) and design cost manager (DCM) report directly to the PM. The DMs focus is on the management of the design program, in relation to scheduling, time, project briefs and quality benchmarks as well as inter-agency co ordination. The DM would also chair the design workshops between the client, consultants and contractor. The DCMs concerns, however, are in the particular field of cost control in the design development process. The contract administrator would remain the facilitator of the cost control and reporting process during construction. All other management personnel, such as services, finishes and structure managers, would report directly to the project manager during the construction process. Interaction between these managers, the design manager and the design cost manager is required during the design development process. To avoid the 'chaos affect' that the PDDM structure caused (see Figure 3c), all management personnel remain directly accountable to the project manager.

Figure 4 *DCM structure – Tiered reporting and responsibilities*

DESIGN COST MANAGEMENT (DCM) ORGANIZATION

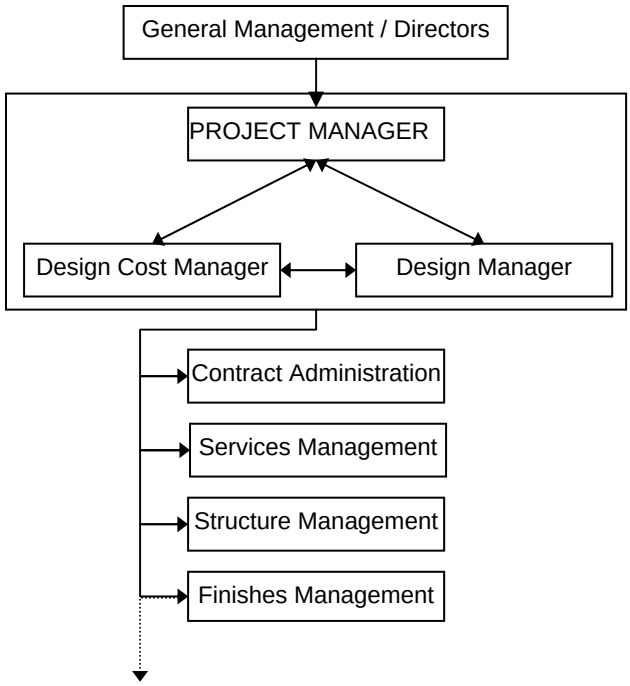


Figure 4: DCM structure – Tiered reporting and responsibilities

CONCLUSIONS: IMPROVEMENTS TO THE SYSTEM

In the case of future development projects, it is suggested that the benchmark for the project be clearly communicated and officially issued to the senior project management team. This may be in terms of an industry standard such as the Property Council of Australia (PCA) rating for an office development, or a Sustainable Energy Design Association (SEDA) rating for the outcome of services and façade design, or by referring to an existing project or market benchmark. The company is seriously considering adopting a standard format for producing project briefs for all future development projects. It is suggested that the main *objectives*, *intentions* and *quality* expectations for the project are stated, probably utilising performance terms to give the project team more flexibility in its interpretation (Smith and Love, 2001). This would also assist in calculating a more accurate feasibility budget, especially if the benchmark can be compared to another project constructed by the company where data is available.

In relation to the anticipated lines of reporting and responsibility in the design cost management structure:

- The project manager (PM) remains the overall project leader, manager and interface between design, cost, program, buildability and construction;
- The design manager (DM) is responsible for issuing all documentation, new and revised. The DM facilitates communication between design consultants and to ensure consultants work within the boundaries of the project brief and quality requirements. The DM is responsible to and reports directly to the project manager;

- The design cost manager (DCM) is responsible for verifying that the design development is in accordance with approved project budgets, project brief and quality requirements in conjunction with the design manager. The DCM is responsible to and reports directly to the project manager.

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