International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 4 Issue 07, July-2015

Design Challenges of Project Deliverables in Construction Industry in Bangalore

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Abstract: **Architectural design that's been produced involves various principles and forms/organisation of design which is been designed with best Architect and Interior Designer/Lighting designers/Landscape designer/Urban, Town planner/Structural designer/MEP designers/Façade Glazing consultants. They prepare working drawings and technical specifications (Bill of Quantities and Materials) that needs to be coordinated with the Architectural design. The coordination between the Interior/Base build drawings and MEP services wherein the HVAC ducting, Fire Detection Alarm system, Public Address system, Electrical raceways conduits, Networking, CCTV, Access Control system, Integrated Building management system, Lighting fixtures and dimming control package needs to be reviewed and checked thoroughly in order to avoid construction OVERLAP/Intersection and mismatch clashed at site. Majority of construction projects suffer time, cost and quality related issues and these have been attributed to inadequate knowledge and understanding of the project sequence in advance. The paper highlights this issue and challenges of delivering the construction project and expresses the need for proper preparedness on a project by choosing the right methodology and detailing the same in advance.**

My research work shall be involved with proper coordination of work within the adequate time (Project milestone schedule), Cost schedule (Budget and Project estimate) and valuation Engineering Risk analysis considering 2case study project in Bangalore Silicon city in IT Infrastructure domain. The methodology chosen is such that it represents a "best fit" in any given ground conditions with the lesson learnt method and makes it easier for implementation, so that even a skilled worker could execute the same without the continuous involvement of a supervisor/ in- charge.

In general, many companies consider 4 elements of Productivity such as Cost, Time, Quality and Performance as main elements for the success of a project. The results of the study provide valuable references which would be useful in decision-making with improved coordination services value engineering in urban commercial IT buildings as a project case study estimating the likelihood of project delay and understanding the effects of different risk factors that might be present in a construction project.

Keywords: Coordination, Productivity, Project, Construction, Management

I. INTRODUCTION

A. Designing the building that work

We will discuss on how to design buildings in the most efficient and effective way possible. Step by step, it explains the followings

1) *Pre-establish the limits*: Options regarding the new building size, shape, structure, environmental systems, construction and materials. Those decisions can and should be made before starting the design sketching. If such decisions aren't established in advance, chances are the original designs will be based on inadequate information and false assumptions and will have to be scrapped.
2) *Gather data*: The client and building user's needs to establish an objective basis for creating and judging the building plans that should be followed.
3) *Systematic design procedures*: Create the best possible building plan in the least amount of time.
4) *Spatial and structural rules of thumb*: Establish reasonable design assumptions when precise figures are not available.
5) *Systematic problem-solving methods:* Used by other professionals to the problems of the building design.
6) *Most common errors in the building*: Site relationship, mechanical design, lighting, acoustics and construction coordination.
7) *Design checklist:* To record, coordinate and track the multitude of decisions that are made and often remade several times over throughout a building design projects.

8) *Facilities management data base:* All the information created during the design and documentation process. This turns the information in our drawings and specifications into a permanent asset which can be used to attract future clients, to guide your design and production staff in future projects, and to provide continuing consulting service to your past design clients long after the original buildings are completed.

The steps and techniques described here have been collected through nearly twenty years of observations of effective and ineffective design processes in architectural offices all across our country. They're good data. They work.

The information included here is as valid and useful for designing small buildings as large ones. It works well for interior design and space planning and has many applications in long-range master planning. It's suitable for the student and beginner as well as the experienced design professional.

The Architect is assumed either to have reasonable background knowledge of design office procedures and construction methods or to be in the process of acquiring that knowledge. The information here is also quite helpful to building owners, design clients and facilities managers.

"A design is what the designer has when time and money have run out."

What do designers and planners actually do when they design something?

Traditionally, a designer will review the characteristics of the design problem. He or she will think on it for a while and sketch some ideas. That's followed by more layers of sketching to test and revise the ideas until they work out to a reasonably satisfactory overall solution.

The process can be observed in one or another of the various aforementioned stages any day in almost any design office in the country.

There's another kind of design process- "designing building that works". It might be called "design management," but that phrase is a little ponderous at this point. To dramatize its operational essence, let's call it High speed design.

Over the years some designers and planners have invented remarkably effective techniques for gathering data about a design problem and for organising that information in a way that leads the problem toward "solving itself."

Designers /Architects have discovered diverse, faster and more effective ways of analysing design information, assimilating it and finally expressing it in a comprehensive creative synthesis. I have spent over 20 years observing and recording these techniques. The techniques allow any designer or planner to plan his or her work so that it can then be done with a maximum of certainty and speed. Many such techniques are strictly personal and work only for a few Individuals; others have a universal logic and work for virtually anyone who applies them. The best tools of both types, the best of the best, are laid out for you in this book.

The most important tool in this article is the Predesign and Planning checklist. It also states essentials of "speed designs," mainly predesign, programming, planning methodology, planning rules of thumb and systematic problem solving. A later volume will emphasise more technical details and reference data on energy analysis, feasibility studies, life-cycle costing and other useful concepts.

II. IDENTIFYING THE MAJOR ATTRIBUTES OF THE PROJECT

The goal is to create an abstract model of the completed building that incorporates all the information that exists or can be developed prior to starting any drawings.

There is a hierarchy, a sequence of dependency in any chain of decisions made about a building. To illustrate the point, here is the sequence of data and decisions required for a typical building project – starting from the end and moving to the beginning.

1) One of the final decisions of a designer is *Material finishes*. Finishes are limited by the choices of materials available.
2) Choices of materials are limited by the construction methods, framing and structures.
3) Construction framing and structure are limited by circumstances of *budget*, required construction speed, building shape, heights and spans of the building.
4) The building shape, height and spans that most affect structure are restricted by site and zoning limitations and are finally determined by interior space sizes, shapes and relationships.
5) Choices of spatial sizes and relationships are limited by the building's population, circulation system and equipment.
6) Building population, circulation system and equipment are determined by the building's primary and secondary functions.
7) The building's functions are decided by the client's overall values, needs and plans as qualified by financial, regulatory, siting, and other circumstantial restraints.

At each step of the way there are a multitude of choices, but the number of choices is limited to the restraint established by previous choices. Thus the values and purpose of predesign are that it gives the designer a workable set of limits.

Here is an abbreviated start to finish sequence of design decisions similar to that used by several large architectural and interior design firms;

1) Overall size and shape, determined by function and occupancy and by external restrictions.
2) Site planning to accommodate the building functions and building shell
3) Space planning
4) Structure
5) Interior materials and finishes
6) External materials and finishes

This first phase of predesign creates an abstract design of the building as a whole in words and numbers. Later predesign decision-making sessions will cycle downward in smaller and smaller units-from the building to the whole, to subdivisions, to individual's rooms, to individual elements and features of each room.

A. The Preliminary Design program Checklist

Here is the basic attribute identification process in a checklist format;

1) Client:
2) Client representatives (names, titles, addresses, phone numbers):
3) Chain of responsibility or decision making in client's organisation:
4) Source of financing:
5) Client's general stated needs and desires:
6) Overriding goal and purpose of building project:
7) Primary building functions:

Make separate lists of sub functions, site features and rooms and spaces and review those space needs with the user questionnaire shown at the end of this chapter

1) Secondary building functions
2) Estimated construction budget: Phases
3) Estimated construction deadline(s): Phases
4) Estimated occupant populations type(s) and size(s) to fulfil stated function(s):
5) Special equipment to fulfil stated function(s):
6) Special furnishings to fulfil stated function(s):
7) Building or building division size(s) to accommodate population, circulation, furnishings and equipment.
8) Future building functions and populations:

Use separate sheet of list or record sub-functions and list of rooms or spatial functions.

1) Limits or allowable size of future expansion:
2) Existing facilities to be part of this project:
3) Existing facilities to use as design or planning examples for this project:

To make preliminary height and shaping decisions that affect spatial allocation, external and internal, determine the following.

External Restraints on building area, shape and height as indicated below;

1) Total lot of dimensions and areas:
2) Usable lot area:
3) Setback restrictions:
4) Other zoning restrictions:
5) Deed covenants
6) Easements
7) Rights-of way
8) Air rights
9) Façade easement
10) Existing construction
11) Solar orientation
12) Building shadow restrictions
13) Required public spaces
14) others

Internal Restraints on Building area, shape and height

1) Groupings of populations or function that require large open spaces:
2) Groupings of populations or function that require courts or atria:
3) Groupings of populations or function that require direct access to exterior ground level:
4) Functions that require high-ceiling interior spaces
5) Functions requiring daylight
6) Views
7) Others

Basic Predesign decision making can most conveniently be done manually with a checklist. But all such data then have to be input to a computer as part of documenting every step of a design project.(*Courtesy of Herman Miller)

B. Just what is it that designers and Planners Do?

"Professional planners and consultants don't necessarily know more than other people, they're just better organised and have slides"

Designers and planners don't just move shapes around or "draw plans". These are among the least and last things they do.

What designers do includes dealing with sometimes capricious and irrational clients who insist you can squeeze 10,000 square feet or function into 5000 square feet of space, or a $500,000 design into a $100,000 budget.

Designers help client get variances from zoning laws. They help people borrow money to finance a building. They often sit for hours listening to gibberish at the offices of regulatory agencies. They sometimes spend weeks working on design presentations to show to a client who has decided to hire another firm but is embarrassed to say so.

The day to day tasks are supportive, that is, they exist as part of the larger job of designing worthwhile environments for people. And that job encompasses a whole universe of ideas including ethics, politics, aesthetics, psychology, epistemology and metaphysics.

Designers sometimes aren't much fun to talk to because they are so deeply involved in the world of ideas they would rather listen to pig grunts than endure normal conversational small talk. Ultimately it is the world of ideas that motivates designers. Abstract conceptualisation and ideology are what underlie the physical reality of their designs. Anyone who seeks to understand the concrete reality of their constructs without knowing the ideas behind them will miss the point entirely.

C. *Attribute listing, or what to do when you don't know what to do*

When you don't know what you're doing:

1) Delegate it
2) Do it neatly
3) Make a list

Here are three axioms that point to ways to keep any problem-solving session from bogging down:

1) A problem requires some change or changes to effect a solution.
2) There are a limited number of kinds of things that can be changed. These include parts, materials, locations, sizes, shapes, actions, sequences of action, functions, relationships, environment, movement, position (such as vertical)
3) There are a limited number of ways in which things can be changes. These include reversal, inversion, relocation, substitution, elimination, separation, transposition.

D. *Categorization Criteria*

Several authors have identified the many characteristics and attributes of projects that could conceivably be used as criteria to categorize projects. These are summarized by Crawford et al (2004) with this list:

Attributes of projects

1) Application area or product
2) Stage of life-cycle
3) Grouped or single
4) Strategic importance
5) Strategic driver
6) Geography
7) Scope
8) Timing
9) Uncertainty
10) Risk
11) Complexity
12) Customer
13) Ownership
14) Contractual

Any of these, or any combination of them, could be used to categorize a group of projects, depending on the purpose at hand. Perhaps the reason that little progress has been made to date in developing an agreed overall categorization system is the existence of this wide variety of project attributes and their various combinations.

E. *Strategic Project Management*

The most effective method of categorizing projects for strategic management purposes will not be the same as the best categorization method for operational project management purposes. These strategic purposes include:

1) *Project selection*: Determining which potential projects are to be funded and executed.
2) *Prioritize selected projects:* Determining the relative importance of selected projects to assist in allocating scarce resources.
3) *Define Portfolios*: Determining the most effective way of grouping projects within specifically defined project portfolios.
4) *Manage project portfolios:* Designing, implementing, and operating the project portfolio management process of the organization.
5) *Allocate resources to portfolios and projects within portfolios:* Deciding the best deployment of money and other limited resources across all project portfolios and among the projects within each portfolio.
6) *Other:* No doubt other strategic PM uses can be identified.

The engineering has three operating groups; project management, design and procurement.

Project manager are technical expects and feel qualified to do all of the engineering estimates without consulting the line manager.

Project engineers are primarily responsible for coordinating the design efforts (i.e., electrical, civil, HVAC, etc…) that they dedicated to the project and must be willing to complete the effort within time, cost and performance.

The purpose of this research is to investigate management in the construction industry. It explores managerial skills, training and the impact of the recession. To ensure our research met our objectives we worked with change and talent management experts.

By Crelos from CIOB, who offered us an excellent insight into management and leadership skills

This research will attempt to gain insight into what construction managers require and how they have responded to the financial crisis, which left many without jobs.

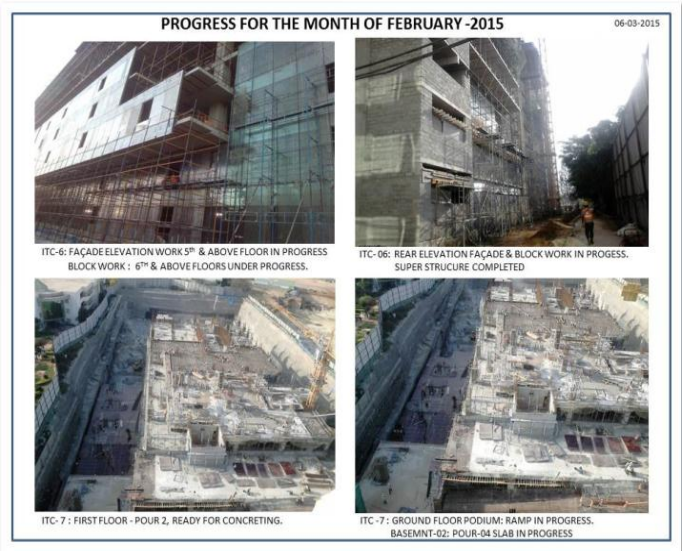
Project manager's objectives during staffing are to;

1. Acquire the best available assets and try to improve them.
2. Provide a good working environment for all personnel.
3. Make sure that all resources are applied effectively and efficiently so that all constraints are met, if possible.

This research explored construction management and how it relates to management in more general terms. 70% of respondents felt that the qualities and skills needed by construction managers are different to those needed by managers in other industries, primarily because construction managers need to be more adaptable and flexible in their approach.

The research has revealed some interesting, yet concerning results; despite the industry's drive for diversity in recent years, 60% consider promoting equality and standards to be one of their weakest skills. The majority of respondents considered promoting equality and encouraging innovation to be their worst skills

CASE STUDIES: TECH MAHINDRA PROJECT



III. System of Action

A. Management focus:

1) Planning
2) Allocated responsibility
3) Controlling and problem solving
4) Creating routine and equilibrium
5) Power retention
6) Creating compliance
7) Emphasizing the contractual obligation
8) Leader detachment and rationality
9) Reactive environment approach

B. Leadership focus:

1) Vision and Mission
2) Infusing vision
3) Motivating and inspiring
4) Creating change and innovation
5) Empowerment of others
6) Creating commitment
7) Stimulating extra effort
8) Leader interests in others and intuition
9) Proactive environment approach

It is not surprising that managing projects and problem solving skills were considered by the majority to be their best skills. These are both key skills required by construction managers due to the nature of the projects with which they are involved. The majority felt that their worst skills were promoting equality and encouraging innovation. Both of these skills are often considered more in-line with leadership rather than management, along with planning and implementing change and transparency. However, despite leadership skills being considered among the worst, providing leadership is considered by 80% to be one of their best skills.

Construction management is a modern profession that developed in an attempt to improve the construction process. The construction manager has been described as a person 'working with the owner, architect/engineer and contractors to create a more favourable environment for efficient construction practices' and someone who' assumes the application of management to maximise the quality and minimise cost and time of delivery'

C. Management Objective

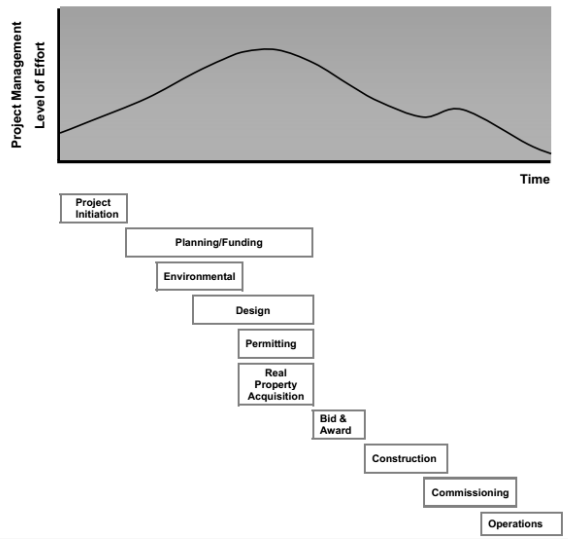
1) All projects must have a beginning and an end.
2) Project managers with prior relevant experience help keep projects on track.
3) Projects are defined by their scope, budget, and schedule.
4) Project life cycle phases for a typical construction project are initiation, planning, design, construction, commissioning, and closeout.
5) The level of project management effort depends on project size, type, and phase.

Report consists of a number of planned projects that when implemented will provide the Agency with the assets needed to achieve its strategic objectives. A project begins its life cycle when it is authorized to move from the Planning into implementation. For an Agency, authorization is often a resolution approved by the Agency's board to apply for funds or hire consultants to work on the project. The board resolution is the project's authorization to proceed to the next phase. In most cases, the Agency will have to come back to the board prior to beginning the next phase of the project, because the scope and costs will be more defined through the efforts made in the preceding phases

In a traditional design/bid/build (D/B/B) project, the project life cycle begins with the initiation of planning (including environmental and funding), and design (including conceptual design). These phases overlap to

some extent. During these phases the project evolves through consideration of various alternatives and the concept for the preferred alternative is formed. The design phase continues through the preliminary engineering effort to further analyse, validate, and define the preferred alternative and arrive at the baseline scope, budget, and schedule. Then the design phase concludes with the final design, which further details out the design features to provide the permitting agencies and the contractor a set of construction drawings and specifications to permit and build the project. The construction phase proceeds with the bid and award process. At the end of the construction phase, the work of the contractor needs to be integrated with operations and Agency furnished activities, technology, and equipment, and evaluated for acceptance through the commissioning phase to bring the project to a successful completion.

The figure 1.1 below shows a typical project life cycle for traditional design/bid/build delivery.



6) Successful projects balance project scope, cost, and schedule with user needs and project constraints.
7) Identification of the user needs, project constraints, and resource requirements early in the project life cycle help projects meet their objectives.
8) The greatest risk to project success is scope creep.
9) Well-defined configuration management and change procedures are needed to control scope.

D. Evaluation of Project

The topics to be addressed in a "Project Request Package" for evaluation include:
1) Project overview
2) Benefits discussed in terms of support of Agency goals and objectives (addressing asset gap)
3) Economic assessment (net present value, full life cycle cost, and funding requirement)
4) Financing (grant, debt, and/or innovative financing)
5) Project budget estimate
6) Major milestones and deliverables
7) Risk assessment.

With the above standard review and approval framework in place, criteria can be established with which to rank the projects. Ranking is necessary because public Agencies rarely, if ever, have sufficient funds to undertake all proposed projects.

III. PROJECT REQUIREMENTS

In the Project Requirement the project manager refines and details the project authorization and details what the project is required to accomplish in terms of the products/services the project will deliver and the scope of work that needs to be done. Through a well-written requirement, the project manager provides project team members, corporate sponsors, and other stakeholders with a common understanding of what the project is all about that defines the project. Review and acceptance of the requirement by the client responsible for the project's authorization helps make certain that the executive, the project manager, and the project team have a common understanding of the project's objectives. Whether by formal sign-off or less formal email, it is important that the project manager receives a record of the acceptance of the project requirements by the Agency's executive so there is no misunderstanding at the outset of what the project is intended to accomplish.

Si no	Topic	Description
1	Authorization	Reference to project authorization that selected and authorized the project.
2	Stakeholders	Corporate sponsors – Client , Customers, third parties impacted, project team
3	Deliverables	Design Products/MEP services the project will deliver
4	Scope of Work	Developed a high-level work breakdown structure (WBS) of the project work phases: Work to be done to deliver the products/ MEP services (high-level summary)
5	Cost Estimate	Initial order of Preliminary estimate of the project budget
6	Schedule Milestones	Initial project schedule in terms of key project milestones with project start and completion date
7	Finance	Project financial requirements and sources of funding
8	Risks	Threats to the project (e.g. adverse environmental factors)
9	Resources	Resources needed to accomplish the project-e.g., environmental specialists, architects and engineers, construction contractors, and equipment suppliers
10	Constraints	Constraints such as limited resources/funding, sites available, etc.
11	Acceptance Criteria	What determines acceptable products/services and their approval

III. PROBLEMS

In the project environment the cause and effect relationships are almost always readily apparent. Good project management will examine the effects in order to better understand the cause and possibly prevent it from occurring again. Below are causes and effects;

A. Effects

1) Late completion of activities
2) Cost overruns
3) Substandard performance
4) High turnover in project staff
5) High turnover in functional staff
6) Two functional departments performing the same activities on one project.

B. Causes

1) Top management not recognizing this activity as a project
2) Too many projects going on at one time
3) Impossible schedule commitments
4) No functional input into the planning phase
5) No one person responsible for the total project
6) Poor control of design changes
7) Poor control of customer changes
8) Poor understanding of the Project Manager's Job
9) Wrong person assigned as Project Manager
10) No integrated planning and control
11) Company resources are over committed
12) Unrealistic planning and scheduling
13) No project cost accounting ability
14) Conflicting project priorities
15) Poorly organised project office

This problem has been adapted from Russell D.Archibald, Managing High-technology Programs and Projecs, New York: John Wiley, 1976.

IV. ROAD AHEAD

Crelos comment in CIOB research "Like most industries, the construction industry is suffering from high levels of disengagement and risk losing talented employees to other organisations, or worst, to organisations outside of the industry.

The results of this study indicate insufficient research has been published regarding project management methodologies: Further research is necessary to enhance understanding and increase the employing of this important concept. For practitioners this means increasing project efficiency and chances of project success. For researchers and academics this offers clues for establishing a generally acceptable formal theory of project management.

The main issues which should be considered in future research include:

1) Project management methodology logics, structures, dimensions and contents
2) The connection between backgrounds and circumstances, methodologies and projects
3) The connection between project management methodologies and theory
4) The expected and actual benefits of project management methodology usage

This is exactly what project management methodologies are all about: Even a collection of recognized project management processes and best practices must be applied, as opposed to blindly followed, according to relevant backgrounds and circumstances. It is no surprise contingency theory is recognised as a potent platform for a theory of project management (Bredillet, 2007; Artto and Kujala, 2008; Söderlund, 2010). It is very likely project management methodologies can offer clues for establishing such a theory

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