

Integrated Assessment of Project Management in relation to Quality Management within Construction Projects focusing the Iron Triangle

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Abstract— The research evaluates the trends and techniques for success criteria of project management and development of life-cycle. It focuses on time; cost & quality with the emerging trend of the iron triangle from the last 50 years the “TIT” have been indivisibly linked with measuring the success of project management. Research in this area so far has mainly been devoted to identifying causes of time, cost and quality overruns. There is limited research geared at studying factors inhibiting the quality management and ability of practitioners to effectively control their projects. To fill this gap, research has been conducted on construction project within Pakistan, which was followed by face-to-face interviews with experienced construction project stakeholders. A brief interview with all stakeholders has evaluated that the contractor has lack of knowledge of project management & project delivery method skills. From the evaluation of the project several deficiencies are assessed within project. It is suggested that project participants can use the information from this thesis to identify deficiencies in their project-related activities and therefore, take the appropriate action to improve their management practices in future projects.

Keywords — Project Management, Life Cycle, the Iron-Triangle (TIT), Stakeholders, Overruns, ISO Standards

1 INTRODUCTION

THE Project Management in construction project of Wassay Tower expedites some tools and techniques for planning, monitoring and execution while staying within the limits of “The Iron Triangle”. This project executes multi-story residential building with specified “Time, cost and quality. For achieving the quality management with in construction projects there is essential need of well-defined aims, objectives and goals. There has been a lot of the research carried for defining a project; in simple words “A project is an organization of people dedicated to a specific purpose or objective. In construction projects, activities are typically divided into functional areas, which are performed by different disciplines” (e.g. architects, engineers, and contractors). (Munns & Bjeirmi, 1996) also stated that project contains specific activities associated with time, cost and defined quality. According to (Atkinson, 1999) identified that a project is a series of different activities involving human resources, financial, and organizing aspects to obtain an integrated product. (Kerzner, 2003) stated in his research that the project and its management is the process of “planning, organizing, controlling & managing resources” to achieve set targets and successful project.

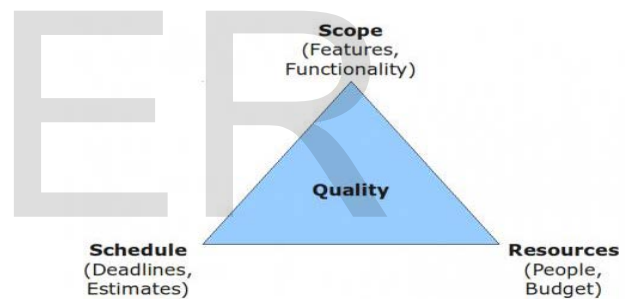


Figure 1. Three Major aspects of the project

2 INTEGRATED ROLE OF PROJECT MANAGEMENT

The integrated role of project management has been widely used and applied in various projects especially in construction project this technique plays vital role to achieve “the iron triangle”. The project management role is one of the most exclusive and most challenging roles to control overall projects and its resources. Project Manager is the one who handles all the duties related to project management. From very beginning to the end project manager is sole responsible for all activities. As the project moves forward and achieves success steps through its life cycle phase’s then project manager should adapt himself to the new challenges and obstacles in order to convert threats into opportunities.

3 PROJECT MANAGEMENT LIFE-CYCLE

Westland (2006) mentioned that there are five major PM Phases:

- 1) Initiating
- 2) Planning

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- 3) Executive
- 4) Controlling
- 5) Closing

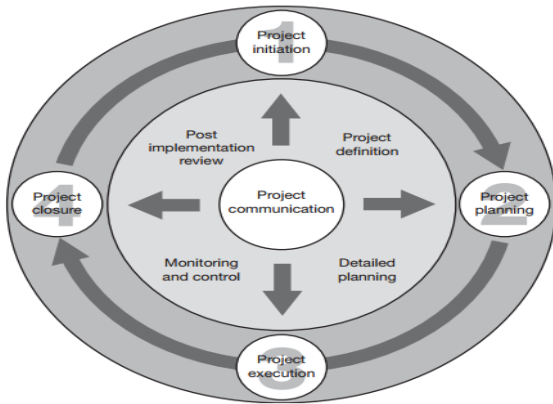


Figure 3. Project Life Cycle four phases Westland (2006)

4 QUALITY MANAGEMENT

(Ashokkumar, 2007) illustrated that Quality ISO “defines quality as the degree of excellence in a competitive sense, such as reliability, serviceability, maintainability or even individual characteristics”. In general, people think quality as a best product or output of any service that comes up to the expectations. Indeed, all the expectations are lying on the basis of use and its cost. (Ashokkumar, 2007) mentioned that according to (Dale Besterfield, 2004), the Quality can be identified as:

$$Q = P / E$$

Where: Q = Quality P = Performance E = Expectation
Whereas, if the $Q > 1$ the client achieves great satisfaction. However, if the contractor demonstrated best performance and delivery of the product or service then it will increase the ration of demand. (Ashokkumar, 2007) has also enlightened the Quality systems “refer to the organizational structure, process, resource and procedure needed to implement quality management”. (Cooke-Davies, 2002) mentioned that the strategies are the best possible processes and decisions that have been translated through corporate strategic development with projects.

5 FOCUSED APPROACH TOWARDS QUALITY MANAGEMENT (WASSAY TOWER)

The word quality refers to the excellence, most of the time two objects or materials are usually judged by their qualities. According to International Organization for Standardization (ISO 9000:2000) defines quality as “the degree to which a set of inherent characteristics fulfills requirements”. Quality in construction industry is the major issue all around the world. In same way it is major challenge for the construction industry of the Pakistan as well. When we are talking about the quality of building project of Wassay Tower then it looks quite satisfactory. (Dvir et al.,2003)&(Khan, & Khoso 2014) identified that the quality of any construction project is judged by the material used at the construction site, technical persons, engineers, labors & methods of construction work employed in the

project. The quality of material is the key source for the quality of overall project. If the material used in any construction project is good enough than its overall quality of the project will be good, in same way if the quality of the material is poor than overall quality of project will be poor. Most frequently used materials at construction of Wassay Tower were Cement, fine aggregate (sand) coarse aggregate (stone / crush), reinforcement (steel), bricks, tiles & water. The quality of these materials which was noticed at project is discussed below:

5.1 Cement:

In construction industry cement is considered as versatile material & it is extensively used as binding material. The type of cement which was used at Wassay Tower project was ordinary Portland cement (O.P.C) but that cement was 3 months old than manufacturing date. But ISO recommends that cement should be used as fresh as much possible because with the passage of the time strength of cement decreases, decrease in strength as relative to fresh cement is shown in Table 1 below.

Table1. Showing the ISO Standards for Storage of Cement

TIME	3 (MONTHS)	6 (MONTHS)	1 (YEAR)	5 (YEARS)
STRENGTH	20%	30%	40%	50%

When this idea was discussed to engineer Wassay that with storage the strength of cement decreases, he replied that builders always remains in the fear of increasing rate of materials so they try to keep themselves safe from any loss. We keep at least 6 months in advance and that reduces 30% of its strength.

5.2 Fine Aggregate (sand)

Fine aggregate is used as filler material in construction work. It makes the structural elements like beams, columns, slabs etc. impermeable. Fine aggregate which was used on the construction site was well graded, hard, strong, & durable. It was free from silt, Clay, salt & any organic matter that may attack the reinforcement.

5.3 Coarse Aggregate (Stone/Crush):

Strength of any structural element like beams, column, and slabs depends upon the quality of coarse aggregate. The coarse aggregate which was used at the construction site were strong, durable, with round shape & well graded & with angular sharp corners, & non-porous.

5.4 Reinforcement (Steel)

The steel used at the construction of Wassay Tower was AAMRILI mild steel, the specification of which are shown in Table 2. It was used to increase the tensile strength of the structural elements & AAMRILI steel has much flexibility than others. Besides that, usage of steel was done in proper way according to needs & specifications of the project. Steel used at the site was free from rust & corrosion.

Table 2. Showing the Specification of steel used in project

FOR RAFT	FOR COL-UMNS	FOR BEAMS	FOR SLAB
(1) MAIN BAR DIA #6	(1) MAIN BAR #6	(1) MAIN BAR #5	(1) MAIN BARS #5
(2) DISTRIBUTION	(2) TIES #3		(2) DISTRIBUTION

TION BARS #6		(2) TIE BAR #3	TION BARS #4
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5.5 Bricks

Brick are block of tempered clay molded to suitable shape & size. These bricks were used for project of Wassay Tower for partitioning of wall. According to Engineer Wassay he told that there are four categories of 1st class category which is considered as the best quality brick. Second class category which also a good category brick but its strength is somewhat less than the 1st class, another category is 3rd class brick which cannot be for such project. (Khosro et al., 2014) mentioned that these bricks can be used for temporary construction & another type of brick is over burnt brick which has irregular shape & size but that brick is strongest brick than the 1st category brick. But 1st class category of brick was used over the construction site. this category of bricks has uniform size, smooth surface, sharp edges & uniform color, besides these qualities it has high strength compared to other category bricks. The size of the brick used on the project was 9×6×6.

5.6 Tiles

Tiles are thin slabs which are used for covering the roofs, floors & for drains. Tiles are usually used for cleanliness purpose. But yet tile was not used on the project, but was intended to be using only tile for flooring. According to engineer of Wassay Tower he told that there are two types of tiles:

- (1) Standard tile (expensive, a good quality, strong & durable)
 - (2) Commercial tile (cheap, fair quality, not much strong & durable)
- a standard tile was used & size of tile brick was 1'×1'.

5.7 Quality of Concreting Proportions in Wassay Tower:

Concrete is a composite material which is made with combination of binding material, fine aggregate (sand), Coarse Aggregate (stone / crush) & water forms a concrete. All materials which are used for the preparation of the concrete at the project were of good quality besides these materials water also plays a great role for the preparation of concrete. (Salim Khoso et al.,2016)suggested that it is always recommended that water used in the concrete should be drinkable water but in same water used for the concrete at project was drinkable water& its PH was seven. Different ratios of concrete which were used at construction of project of Wassay Tower were the following

- 1) Lean concrete at base 1:3:6
- 2) Raft concrete at base 1:1.5:3
- 3) Columns concrete ratio 1:2:4
- 4) Beams concrete ratio 1:2:4
- 5) Slab concrete ratio 1:2:4
- 6) Topping concrete ratio 1:2:4

6 RESEARCH ANALYSIS

This Research analysis is based on the case study of an actual project called Wassay Tower. It consists of a secondary analysis of documents and project plans on the building project and for which interviews conducted with several peoples involved in project at which observational study was carried out regarding this project by conducting interviews & visiting construction site.

The key barriers in construction projects of Pakistan are following:

- ✓ Lack of Knowledge and awareness to the stakeholders within the construction projects of the Pakistan
- ✓ Weak regulations and control in construction projects
- ✓ Lack of proper training & experience of project management
- ✓ Project fraud & corruption
- ✓ Government Regulations and Socio-Political pressures

Therefore, it is recommended that Pakistan needs a applied and integrated approach toward the path of success in management of construction project within shorter time and limited budget. In comparison to developed countries, Pakistan construction industry needs a management approach and use of modern tools and techniques to get maximum out with minimum resources utilization. The interviews were mainly based on discussing the key issues of the construction project management like controlling on (Time, Cost & Quality). Following figure provides more information about all the interviews. The Following Graph is a mix of all stakeholders with varying job description but mostly similar kind of projects.

Identified PM inhibiting factors and its Effects

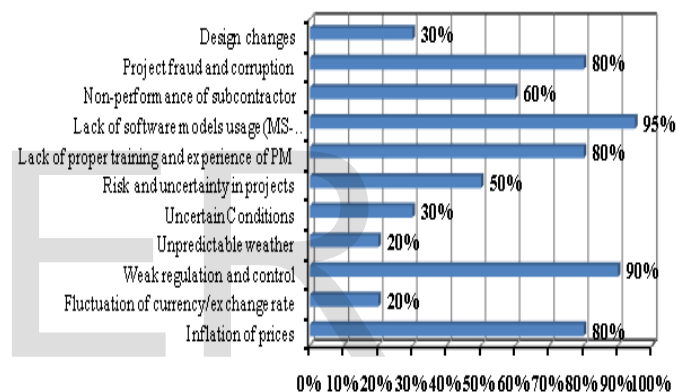


Figure: Inhibiting factors and its Effects on Project's "Iron Triangle"

7 CONCLUSION

The conclusion of this research is depicts the findings of a building project. This case study is based on the opinions of project team participants, contractor & engineers about the importance of integrated role of project management and relationship between times, cost and quality management. This project has a great time management where some of activates are found before the scheduled time and completed near about 70% within approximate cost of 3 million PKR in construction work that is in control limits. From findings the quality was unsatisfactory within the standard of ISO limitations. Especially the construction projects in Pakistan are lacking the quality management tools and techniques. In Order to achieve Project Quality Management (PQM) Pakistan Construction Industry (PCI) has to set goals and strategies to equip project managers and other team members with best training and up to date knowledge of PQM systems. Research identified that the major problems faced by all the stakeholders are:

- Unskilled and Untrained Project Managers and other team members

- Lack of Knowledge and Training
- Shortages of good quality (ISO certified) material
- Skilled labor
- Mechanical plant
- Government Regulations
- Political influence
- Project fraud & corruption
- Overall control system

If these major problems are addressed, then construction industry will get better endeavors and attract foreign investments with in Pakistan. There are great challenges yet to be faced by the construction industry of Pakistan but if the leader PM is well educated and equipped with the Project Management knowledge, skills and education then good quality can be delivered with the help of "The Iron Triangle".

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