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QUALITY IMPROVEMENT, PLANNING AND CONTROL PROGRAM OF HIGH RISE RESIDENTIAL BUILDING IN REFERENCE WITH PMBOK USING MSP"

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ABSTRACT

Quality planning is one of the major aspect which we come across the construction field. Every customer should be provided with the maximum quality output for the money given by them which could be done by the project manager by taking into consideration quality by its proper planning in the project. Quality has become one of the important strategic tool. It is realized as a key element to services and develop products in supporting continuing success. Quality system is set clear view for understanding, organization to follow and involving the employees which proceeding towards common goal. In the race of unending improvement, quality and its measurement plays an important role. The measurement of quality is considered as a trigger for the improvement .Improvement could not be achieved if measurement is not applied and analyzed in order to assist in identifying opportunities for improvement. If there is a defect in a construction then it contributes to the final cost of the product and also to the maintenance cost. Defective construction is one of the factor responsible for the complete failure of a structure.

Keywords: Quality planning, PMBOK, MSP

1. INTRODUCTION

Productive activity, human health, psychological state an indicator of human well-being are affected by quality of housing and living environment. The quality of the works of reconstruction of houses affect their comfort and durability. According to the terms of a modern market economy is necessary to improve the organizational and economic mechanism for construction. Repair and reconstruction of real estate with the qualitative component of the operations. In current state, the important socioeconomic problems of the state development is effective reproductive system of real estate. In order to solve the problem of lack in quality and improve comfort and welfare of living in all sections of the population, an approach is taken in to consideration tat us to establish a mechanisms to improve the quality and availability of housing on the basis of a new approach to the system of work on reconstruction of housing and high-quality capital repairs and works on new construction.

The reference of a book is taken which is internationally published which says that the work which is carried out in the construction sector is affected with some external phase in the time of quality management which has 3 aspects in which the first is quality planning followed by quality assurance and quality control. The PMBOK stands for Project Management Body of Knowledge and it is the entire collection of processes, best practices, terminologies, and guidelines that are accepted as standards within the project management industry. Because the body of knowledge is constantly growing as practitioners discover new methods or best practices, it must be updated and disseminated. This is one of the effort that is seen by the Project Management, the global not-for-profit member association of PM professionals which captures and publishes the PMBOK within the book. The first edition of PMBOK Guide was published in 1996 and now the book has 5 editions, which got published in 2013. In this book the knowledge is provided according to which the factors such as time, machine, material, and method are the factors which affect the quality planning of the

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project taken in to consideration

The concept of quality planning in construction projects is to guarantee efforts to accomplish the necessary level of quality for the outcome which are well planned and organized. It is vitally required for a construction company to have an effective quality management system as it helps organizations in improving customer satisfaction whilst providing the organization with a competitive advantage over fellow competitors within the industry. It is all about obtaining customers' satisfaction that would lead to long term business and competitiveness survival for the industries thus by maintaining the quality of construction activities at a mandatory standard.

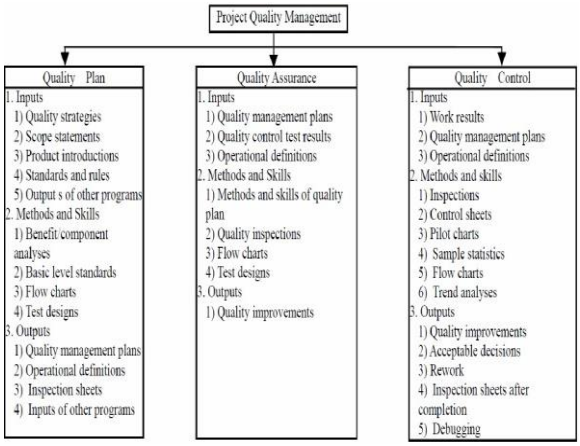

Fig 1. The main flow of project quality management.

Problem Statement

Quality planning refers specifically to the actions of the project management team or the project management team leader to engage in the action of establishing and conducting a process for the purposes of identifying and determining exactly which standards of quality are in fact relevant to the project as a whole, and also in making an effective determination as to how to satisfy them. In the recent activities around the construction industries it is observed that the quality is not maintained in the process, the reason for which is the lack of planning at initial stage where the risk involved is maximum. in order to overcome this factor affecting the poor construction the project was taken into consideration.

Objectives

Quality improvement program for residential building with reference to PMBOK in MS project.

1. To Identify the scope of residential building by refereeing PMBOK
2. To Study factors affecting the project scope management.
3. To Implement WBS for satisfying the project scope.
4. To Develop WBS programme using tool MSP
5. To compare the cost and days of the project completion before and after the implementation of quality checklist.

Businesses, large and small, unquestionably juggle numerous projects, plans, tasks and people. Having a solution that can help them keep organized while planning and running projects, in a way that is accurate, predictable, and profitable is promising.

However, time marches on and technology evolves. Essentially, project management software programs are employed for project planning, time management, resource allocation and for change management. Project management software is among the most useful tools that can help in this project because the factors studied in this project are the inputs given in this software which could be studied and used for satisfying the objectives. The objectives include the overall planning of the work that is to be carried out in the construction work, the time required for the total work, the work is to be braked down so as to calculate the time involved in it and allocate the resources accordingly by which the cost could be analysed .These factors which are affecting directly on the work can be analysed in this software and accordingly the work could be carried out. This makes the software suitable to satisfy the objectives which are to be carried in this project.

MSP software is a user friendly software used in almost all the high rise construction sectors.it has number of benefits due to which the project managers prefer them to be used in order to solve and deal with difficulties which comes in

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between the collaboration of number of works and its scheduling. Lots of the work regarding the planning which involves large percentage of risk is involved in the initial stage of the project which could be taken care of due to the help of this software. Benefits of this software MSP are collaborate on projects internal and external communication, budget management could be done easily,
monitoring of the project could be done easily ,document sharing ,it increases the communication of clients and suppliers it enhances communication and hives employee responsibility in schedule creation .

2. LITERATURE REVIEW

1. Quality Assurance Strategy for Existing Home: Final Quality Management Primer to High Performing Homes (M. Del Bianco, J. Taggart, J. Sikora, & A. Wood)

Building high performance houses (HPH) that really are power efficient, long-lasting, pleasant, & healthy to live in requires more than just an understanding of building science fundamentals. In addition, it necessitates the ability to develop, define, & implement new technology & systems correctly. Quality monitoring system (QMS) offer the infrastructure required to maintain repeatability and manage continuous improvement in order to maximise first-time quality, decrease warranty costs, & boost customer satisfaction. As a consequence, QMS is required as the industry transitions from constructing ordinary to HPH &, eventually, cutting-edge houses like those that fulfil the DOE's Challenge Home requirements.

This handbook is intended to assist builders in understanding the function of quality management in the transition between conventional to HPH construction & remodelling. It also gives background for the be using of quality assurance in current dwellings. It discusses what quality is, the importance of a quality management system (QMS), the special necessity for a QMS while creating HPH, & the first stages for establishing a thorough QMS.

2. Costs of Poor Quality in Construction (Vishal Vasant Waje, Eng. Vishal Patil)

Its cost of perfection is the cost involved with fault prevention, detection, and resolution. These expenses may emerge the whether object is at the design phase, the production phase, or the customer's possession. It is essential to assess the quality costs in order to calculate the costs involved with manufacturing a quality product. Reliability is now one of the most essential competitive strategic instruments, with many firms seeing it as one fundamental to developing successful goods and services. A value system are intended to provide a clear path for a business to follow, facilitating the knowledge and participation of workers working toward a shared objective. With in cycle of continuous improvement, measuring quality serves a crucial role. The assessment is seen as a catalyst for progress. Unless no measurement is used & analyzed to help find chances for development, no progress may be made.

The purpose of this study is to examine the usage of quality in the construction business. Various industrial ventures are mined for the information essential to accomplish the paper's purpose. The emphasis of the article is on construction faults in various projects and inadequate cost estimation. It further demonstrates that faulty housing construction leads not only to increased construction costs as well as large maintenance costs.

3. Quality Management System at Residential Construction: A Questionnaire Survey (Pravin P. Mane,Pooja Jogdand,Niranjan Ambekar)

Among the most important criteria with in success any construction works is quality. Improvements in building company quality are closely related to the implementation of a quality control system (QMS) throughout the life of the project. This constructions industry's quality administration system includes Quality management, Quality assurance, & Quality monitoring. A quality management strategy assures the consistency of an organisation, product, or service. A qualitative managing system offers a proactive approach towards ensuring the successful & quick execution of such a project development. The efficient QMS would detect the organization's risk & provide mitigation strategies. The QMS views the organisation as a network of processes that collaborate to provide goods & services.

The report presents the results of a qualitative

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questionnaires survey & an in assessment of overall data acquired from researchers via interviews with each of the project's builders/contractors. The question is focused on building projects quality issues.

4. Quality Planning Process of Construction Contractors: Case Studies in Sri Lanka (Sepani Senaratne and Thushangi Jayarathna)

Modern corporations focus more on enhancing the project quality process as part of their attempts to manage performance. Yet, construction companies in poor nations, like Sri Lanka, continue to fall behind on their implementation of comprehensive quality management. Consequently, the primary research problem addressed in this research asked "how would Sri Lankan constructions contractors conduct project quality?" Inside this subject, the key aims of the research had to determine if Sri Lankan constructions contractors perform effective quality management and to what degree they are prepared to undertake strategic quality planning. This quantitative study included three case stories reflecting three major companies of Sri Lanka as its research methodology. The survey indicated as ISO 9000 was the most often used quality administration system among Sri Lankan constructions companies. Many obstacles prevent the contractor from implementing effective strategic planning. Just on basis of overall results of this study example, certain conditions for such effective implementation of process improvement are provided, which would be of value to contracts operating in identical situations.

5. Fast Tracked Concept Based on DSM Model (Shrenik G Sohaliya, Mr.Vikas D Bhavsar)

The objective of a Fast track program management approach is to decrease the duration of the program by straddling its project's planning & construction stages & having as many tasks as feasible run concurrently. The primary objective is to investigate the fast-tracking of such a real estates development.. Then to develop a fast-tracking system based on the matrix of dependence structures. As engineering operations are interconnected & scheduled on the basis of data flow, it's indeed difficult to describe information sharing for such actions using CPM or PERT. Researchers have examined the interdependence architecture matrices as a technique for identifying & managing the transmission of information across activity. Most large infrastructural projects in Ahmedabad were behind schedule for technical or budgetary reasons. Thus, there are significant time loses, because the project cannot be completed on schedule. When it comes to these projects, time is money. Therefore, scheduling is one of acceptable solutions for getting a project back on schedule. Therefore, DSM is a crucial paradigm for expediting projects in emergency situations. In addition, it has employed a prediction system to compute reworking day for subsequent activities.

3. METHODOLOGY

Fig – 2 methodology of the project

4. CASE STUDY

Following are the case study details collected. The site which is taken in to consideration is STARGAZE located in Bavdhan , west Pune zone

,Maharashtra 411021. The design and structural engineer team is JW consultancy .owner of this project is koltepatil The architect of this project are Manoj tatuskar And Vikas acharkar. The cost of per flat starts form 65 lakh onwards. Total area of the project is 1.9 acre.

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Fig 3: 3d eye view of actual site

Fig 4: Floor plan

Fig 5: Plastering at site

Checklist

A project administration checklist specifies actions, timeframes, resources, and objectives. Project leaders, team leaders, and supervisors utilise checklists to organise and track project components. A project assurance checklist helps a team consider all aspects of project and/or process excellence. Most company projects involve personnel, assets, activities, and more. All project participants may use project administration checklists to stay organised, finish tasks on time, and understand their duties. Initiation, planning, implementation, monitoring, and closure are the five phases that make up a project management vicious circle, according to PMBOK Guides (Project Management Body's of Knowledges) by Project Management Institute (PMI). Together, they transform a project concept into a usable product.

Table 1: The table shows the checklist used in the project

CHECKLIST INDEX			
Sr No	**Checklist Name**	**Checklist Number**	**Remarks**
1	Checklist for project preliminary requirement	CL-QA-01	Available
2	Checklist for clearing & grubbing / OGL	CL-QA-03	Available
3	Checklist for checklist for excavation	CL-QA-04	Available
4	Checklist for Block Markout	CL-QA-10	Available
5	Checklist for Center Line Marking & Excavation	CL-QA-11	Available
6	Checklist for Post Excavation	CL-QA-12	Available
7	Checklist for Antitermite	CL-QA-13	Available
8	Checklist for PCC	CL-QA-14	Available
9	Checklist for Pre-Pour	CL-QA-15	Available
10	Checklist for Post-Pour	CL-QA-16	Available

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11	Checklist for Backfilling	CL-QA-17	Available
12	Checklist for Soling	CL-QA-18	Available
13	Checklist for Hacking	CL-QA-19	Available
14	Checklist for Brick/Block Masonary	CL-QA-20	Available
15	Checklist for GI lintel	CL-QA-21	Available
16	Checklist for Lintels & Sun Shades	CL-QA-22	Available
17	Checklist for Cementitious Waterproofing	CL-QA-23	Available
18	Checklist for Bituminous Emulsion System-Brush On	CL-QA-24	Available
19	Checklist for Crystalline Waterproofing-Brush on	CL-QA-25	Available
20	Checklist for Acrylic Waterproofing-Brush on	CL-QA-26	Available
21	Checklist for Expanded Metal Mesh Fixing	CL-QA-27	Available
22	Checklist for Internal Cement Plastering	CL-QA-28	Available
23	Checklist for External Plastering	CL-QA-29	Available
24	Checklist for Dadoing (Wall Tiling)	CL-QA-30	Available
25	Checklist for Wooden Flooring	CL-QA-31	Available
26	Checklist for Floor Tiling	CL-QA-32	Available
27	Checklist for Internal Gypsum/ POP Plastering	CL-QA-33	Available
28	Checklist for UPVC Doors, Ventilators & Windows	CL-QA-34	Available
29	Checklist for Internal Painting	CL-QA-35	Available
30	Checklist for External Painting	CL-QA-36	Available
31	Checklist for Grouting Activity: Tiling	CL-QA-37	Available
32	Checklist for Marble & Granite Flooring	CL-QA-38	Available
33	Checklist for Marble & Granite Cladding	CL-QA-39	Available
34	Checklist for Doors, windows, Handrails	CL-QA-40	Available
35	Checklist For Doors (Fire)	CL-QA-41	Available
36	Checklist For structural Glazing Work	CL-QA-42	Available
37	Checklist For MS Works / Sheeting	CL-QA-43	Available
38	Checklist For Sealant Application	CL-QA-44	Available
39	Checklist For Final Deep Cleaning	CL-QA-45	Available
40	Checklist For Slab Conduit	CL-QA-46	Available
41	Checklist For Wall Conduit	CL-QA-47	Available
42	Checklist For Wiring	CL-QA-48	Available
43	Checklist For Switches & Sockets	CL-QA-49	Available
44	Checklist For Distribution Board	CL-QA-50	Available
45	Checklist For Possesion-Electrical	CL-QA-51	Available
46	Checklist For Internal Plumbing Works	CL-QA-52	Available
47	Checklist For Pressure Test	CL-QA-53	Available

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48	Checklist For UG Sump & OHT works	CL-QA-54	Available
49	Checklist For Manhole & Inspection Chamber	CL-QA-55	Available
50	Checklist For External plumbing Work	CL-QA-56	Available
51	Checklist For Possesion-Plumbing	CL-QA-57	Available
		Total	**51**

5. DATA ANALYSIS

From the data collected the CAD drawings are taken into consideration and with respect to them the activities are derived which are then inserted in the MSP software according to its ascending order .ones this is done BBS (bar bending schedule) is prepared from working drawings the activities are listed out and a work breakdown structure is prepared .The important aspect of quality planning such as time, resources like machine and materials are the factors which act on the project according to the PMBOK.

Ones the work break down structure is generated the activities are allotted with the time which is given to them according to the initial data and if required the days required are given a margin of days by which it could lag or lead which is called as lag or lead. In the fig 3 we could see the days required for completion of the project is 1010days and the activities are 533 .time plays an important role over here thus the activities could be crashed or tracked in order to run them simultaneously and save the time and get the update of the work which is carried at that point of time in completion phase.

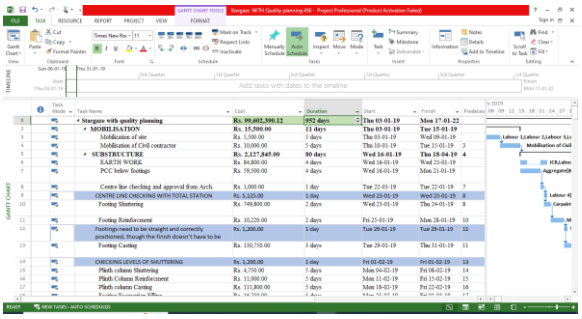

Fig 6: scheduling of the activities creating WBS

When the linking portion of the activities is completed resource sheet is generated in excel sheet which includes the labour charge the material such as cement, bricks, tiles, course aggregate, fine aggregate, CP fittings, the material regarding the mobilization, material for watchman cabin etc. the rates according to the current states in the market are mentioned in these resource sheet labour charges are also included as per the current states. Ones the resource sheet is generated according to the material, human resource and their requirements which is derived according to the requirements mentioned in the BBS (bar bending schedule). Then the resource sheet is imported in the MSP software and each of the activity is allocated with the resources.

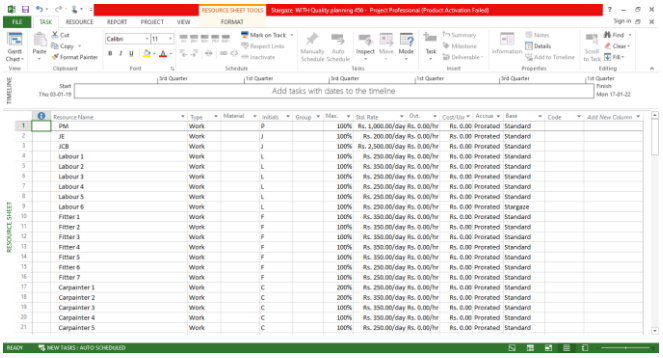

Fig 7: 4 resource sheet

While taking into consideration the factors affecting the quality planning of the construction in reference to PMBOK the resource were allocated and time was optimized. The conventional brick which has a length of 9cm was replaced with SA CLC brick which has a length of 120 cm which resulted in

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the time reduction because the area covered was maximum at a single time and the cement required for filling was less as compared to traditional method and we could see the following changes in the time required in the construction of the building. The plastering which is to be done 2 or 3 times internally in to be replaced by the material gypsum in which the cost was reduced up to a certain level.

6. RESULTS AND DISCUSSION:

In our case the red brick having a labour charge of Rs 80 per sqft for a built up area of 10,946 sqft is replaced by an alternative material which is CLC brick (lights weight) with Rs 100 per sqft with larger dimension yet reducing the transportation charges and saving the time as well. Plastering is having 3 coat brought up to 1 coat as the clc provide finishing so the is used in the construction work in order to speed up the process ,simultaneously lowering the cost and time of the project up to 20%. 600*600 mm dimension tiles are replaced by 800*800 mm dimension of reducing the time and speeding up the process. Cranes , compactors , RMC , lift machines are used efficiently to reduced the time and money.

Table 2: Comparison of stargazes site total cost and total duration with and without quality checklist

Construction type	Total cost (Rs)	Total Duration (days)
Without Quality Planning	Rs. 99,411,371.54	931.66 days
With Quality Planning	Rs. 99,602,39	952 days
	0.12	

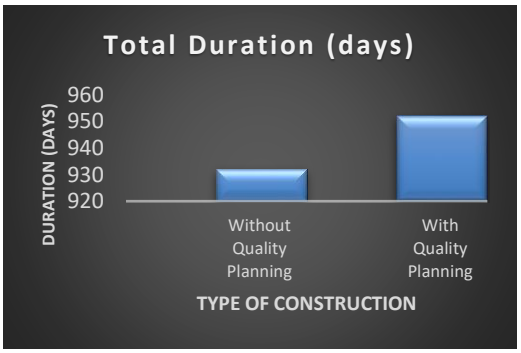

Fig 8: Stargaze Site without Quality checks (Conventionally built)

Fig 9: Stargaze Site without Quality checks (Conventionally built)

7. CONCLUSION AND FUTURE SCOPE

- As we learn from numerous research projects & field trips, there are papers that concentrate on building faults on the relevant projects & inadequate quality cost measurements, which calls for quality planning.
- In construction industry the implementation of quality leads with effective quality planning. In this paper factors affecting quality planning which are time, machine and material as per PMBOK.
- Quality planning factor and its implementation in present case study is done.
- The quality standards referred in PMBOK is found as per ISO 9000 and the time noted in completion of this case study the total cost and time duration of the project with Quality planning checklist which is 952

days and Rs. 99,602,390.12 and for a site without quality checks shows 932 days and Rs. 99,411,371.54.

- The difference in both the type of construction is compared. We are investing 20 days on implementing the quality checks at our site and a total amount of Rs 191018.58 in terms of resources, labour's and supervisors for the construction site of Stargaze which was conventionally built for 1st to 7th floor and quality planned for 7th to 14th floor.

FUTURE SCOPE

The researcher argues that it's important to appreciate how outstanding quality affects a company's entire worth, both financially and in terms of reputation, both of which are long-term goals for the organisation. Designing assurance standards, examining materials, equipments, processes, & product, creating quality controls systems, & deciding on remedial measures are all duties of the quality engineering. You will collaborate with management & supervisor to put quality control measures into place.

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