

A STUDY ON QUALITY FUNCTION DEPLOYMENT IN CONSTRUCTION PROJECTS

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Abstract— The manufacturing sector, companies have successfully applied concurrent engineering tools, including Quality Function Deployment to determine customers needs for the design at its early stages of development. However, despite its success stories in other industries, QFD has been applied only sparingly in the construction industry. Quality Function Deployment is a powerful development methodology with a wide range of applications. The main purpose of QFD in this study was to apply in construction a method of customer oriented design used in other industries. In this report, an attempt has been made to examine the applicability of QFD as a strategic decision making tool in design phase and after the construction stage of a housing project to determine the best marketing strategy, to make a comparison between the performances of different competitors and to transfer the experience gained from the current project to the forthcoming projects. The data collected for the application of QFD is for the small construction company, mainly in housing sector. The first part present a QFD on the design phase of a Real estate construction project as a tool of improvement for layout and features of a high class apartment unit. The data collected for this study is in accordance with the middle class requirement.

Index Terms—About four key words or phrases in alphabetical order, separated by commas.

I. INTRODUCTION

Quality function deployment (QFD) is a quality improvement technique that deals with quality problems from the outset of the product design and development stage and assures that customers requirements are accurately translated into appropriate technical requirements and actions. The emphasis on “voice of the customer “ is the key to QFD. This makes good sense in the construction industry, as every construction project is unique. Each building is custom made to meet the requirements and needs of the client. As the construction matures, the ability to understand and translate the needs of the client into a finished building or product is fast becoming a prerequisite for the long term viability of a company

A. OBJECTIVES

- To understand the QFD technique and its step by step implementation in the planning and design phase of construction projects.
- To examine the feasibility of using QUALITY FUNCTION DEPLOYMENT as a project management tool in the planning and design phase of construction projects.
- To examine the planning and design requirements of apartment building
- To develop a QFD application model that can be implemented in the design of apartment building.
- Developing a QFD application model that can be used in the planning and design of housing sector (apartment building) through a case study.

II. QFD PROCESS

Two popular models illustrate the QFD process. One is the four phase model developed by Mauser and clausung (1988). This is probably the most widely described and used. The other is by Dr, Akao (1990) called the “matrix of Matrices.”Akao’s model is considered gigantic and far reaching (cohen, 1995). The QFD structure is normally presented as a system of matrices, charts, tables, or other diagrams. The four phase model seems to be more common in the QFD application, So it is briefly described here. The four phase model is based on the following key documents or components:

- Overall customer requirement planning matrix-translates the general customer requirements into Specified final product control characteristics.
- Final product characteristic development matrix-translates the output of the planning matrix into critical components characteristics.
- Process plan and quality control charts-identify critical product and process parameters and develop checkpoints and controls for these parameters.
- Operating instructions-identify operation to be performed by plant personnel to ensure that important parameters are achieved.

A. QFD APPLICATION IN A HOUSING PROJECT IN DESIGN PHASE

For this case two techniques can be used for gathering information on customer’s needs and desires for the layout of the residential unit. The first technique adopted interviews with salespeople (real estate agents) who have a strong relationship with buyers and users. Another technique used was the “Focus Group” approach using mid-sized and small-sized groups, obtaining information through question and benchmarking between different projects in order to find out likes, dislikes, trends opinions about similar current and other projects. Different people including real estate agents, architects, engineers, potential buyers and owners of similar apartments composed the focus group.

First step to collect the data is the preparation of questioner and customer identification. Format of question for this project are attached. Some of the important features chosen after the survey are as follows.

1. At least two entrance for the apartment unit: one by the living room and another by the kitchen.
2. A large counter top in the kitchen to provide more space during the preparation of food or other tasks.
3. Floor easy to clean in the kitchen and bathroom.
4. Beautiful wood floor in the living and dining rooms.

B. CASE STUDY: P.K.M AND BUILDERS PVT. LTD.

This project is situated in Jawaharlal nagar, Madurai. It is spread over a staggering area of 12 Acre. It comprises of 160 multi storied furnished apartments of 2-3 bedroom apartments. Projects is a joint venture between P.K.M and Builders Pvt. Ltd. With capacite infra associates. Consultant Design: In house company of P.K.M & Builders.

Architects: KIPA Projects.

Project Start Date: March 2014.

Proposed Completion Date: December 2016.

It consists of 8 Buildings each of 6 floors.

3BHK Flats: Total – 120

2BHK Flats: Total – 40

Total cost of the project: Rs. 38 crores

Flat specifications are given below. Plans of these flats are attached in the annexure.

1. 3 Bedroom Apartment (1490 Sq.ft).

3 Units of 3 Bedroom flats in each floor

Living, Dining, 3-Bedrooms with attachment toilets in two, Kitchen, Common toilet, Utility room, Balconies. Super Area = 1490 Sq.ft.

2. Bedroom Apartment (1200 Sq.ft).

1 Units of 2 Bedroom on each floor with a Super Area = 1200 Sq.ft.

Living, Dining, 2-Bedrooms with attachment toilets in one, Kitchen, Common toilet, Utility room, Balconies.

C. CASE STUDY FOR BENCHMARKING

Competitor No.1: Spectrum engineers, Madurai
 IMPERIAL RESIDENCE

Imperial Residence is situated at Ellies nagar, Madurai.

The project is promoted by spectrum engineers which has projects in kaalavasal to samayanallur Road.

Table 1 Features & Accommodation

1	Decorative entrance lobby
2	Landscaped Garden
3	Club house with indoor games
4	Gymnasium, multipurpose hall, pantry
5	Children play with equipments
6	Open amphi theatre
7	Jogging track
8	Swimming pool with baby pool
9	Adequate visitors parking
10	Inverter for the entire flat
11	Generator back up for lift/open areas/club house/pumps
12	Intercom facility

D. COMPARATIVE ANALYSIS OF MARKETING PHASE QFD

The customer requirements are rated on 1 to 5 scales for all case studies. i.e. 1-bad to

Srl. No	Customer Requirement	P.K. M.Grou p	Competitor 1
1	Social differentiation	5	4
2	Large apartment unit	4	5
3	Functionality and quality of materials/fixed furniture used in the kitchen	4	5
4	Functionality and quality of accessories/ materials used in bathrooms	4	5
5	Availability of independent in house storage unit	4	5
6	Architectural layout of the apartment unit	4	4
7	Security from external threats	3	3
8	Parking area/garage	4	5
9	Indoor swimming pool	5	4
10	Fitness center	3	5
11	Playrooms and play field for the children	4	4

12	Sufficient green area for recreational purposes	4	4
13	Earthquake resistance	4	3
14	Air conditioning	3	2
15	Efficient central cooling	2	2
16	Continuous water and electricity supply	4	5
17	Low energy costs and high thermal quality	4	3
18	Availability of smoke/fire detectors	3	5
19	Efficient fire extinguishing system	4	4
20	Sufficient number of elevators with speed	5	4
21	Good and fascinating sight	4	4

III. CONCLUSIONS

QFD is a valuable and very flexible tool for Design. The sequence of parts and steps during the QFD process can be changed according to the strategy adopted by the design team. The correlation matrix is the heart of the QFD process and stores precious information needed for design improvements.

QFD helps prioritize the improvements and design specifications. QFD also helps translating the buyers and users needs into information that can be managed by the design team. Besides, it facilitates the use of benchmarking information in a systematic way. The most difficult aspect in the use of the QFD as a tool in the design of a real estate project was the previous lack or strong coordination in the beginning of the project especially in features related to detail solutions. Another difficult was making the project team recognize that QFD is a powerful and flexible tool for construction. One last important issue in the use of QFD is the size of the core matrix.

QFD provide the framework to the architect and engineer for designing the project and writing the project specification i.e. design improvement as found in the previous section of QFD findings. It should be noted that there are some difficulties associated with the QFD process

- The inability of the focus group to express clearly the needs and requirements\
- Reconciling similar requests of various customers, differentiating between design attributes and solutions to certain problems.
- Difficulties in working with large-sized matrices and hence, reducing WHAT to HOW to a manageable number without sacrificing the VOC
- Reaching a consensus on the evaluation ratings, and choosing the critical items for the HOQ and most importantly

➤ Time constraints

The other challenging aspect of the QFD process can be the processing of the information entered in the QFD matrices. The success of making new design concepts or improving the existing design layouts to satisfy the customers largely depends in the interpretation of the input in the matrices.

The process provides a systematic procedure and a forum for all parties affecting or affected by the project to communicate

their needs objectively, priorities such needs according to the overall project goals, reach a consensus systematically, and make critical decisions in a manner- that eliminates design mistakes and oversights. Thus, QFD process can minimize cause of construction delays, materials waste, and quality degradation

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