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Application of Value Engineering Process in Architectural Layout Planning-A Case Study

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Abstract: ***Value engineering (VE) is a powerful problem-solving tool that can reduce costs while maintaining or improving performance and quality requirements (Brijesh Ramani, Dr. Jayeshkumar Pitroda; 2017). Value methodologies can be applied during any stage of a project's development cycle, although the greatest benefit and resource savings are typically achieved early in development during the conceptual stages, at this point, the basic information of the project is established, but major design and development resources have not yet been committed (Prof. Nitin L. Rane, Prof. P.M. Attarde; 2016). At this stage construction work has not started and alternatives can be analysed to provide maximum functionality. Cost reduction does not always mean compromising quality, instead of improving the functionality to decrease the future cost which may be incurred during ongoing construction modifications. This study aims to analyse the layout of an existing high rise residential complex and identify whether a more functional iteration can be achieved which compromising the area and requirements. Although there are many stakeholders involved in the construction project this exercise should still be applied by the designers or third-party stakeholders who can reiterate and ascertain to provide the best possible solution.***

Keywords: Value Engineering, Value Management, Value Analysis

I. INTRODUCTION

Value Engineering is a systematic study to seek out the best functional balance between the cost, reliability and performance of a project (Prof. Nitin L. Rane, Prof. P.M. Attarde; 2016). Whether VE is a requirement or not, it is a valuable tool for contractors in satisfying the owner's needs and ensuring money is wisely spent (Jillian K Seidel W. Mac Ware, Advisor; 2012). This process can be applied at any stage, but if we apply it during construction, the modifications in designs would be costly and can also increase the project's timeline. During this phase, all value engineering suggestions are scrutinized to determine the entire impact of the change on the project and are often difficult to implement. That is why, to save a significant amount of project cost in the future, it is vital to critically examine and apply this activity during the design process.

II. AIM:

This study aims to apply the Value Engineering process to a 3BHK layout to understand the influence of 'design' on the cost of the project and on how value can be increased without compromising the functionality.

III. METHODOLOGY OF THE CASE STUDY

A plan of a 3 BHK flat already on offer in the market is taken for the case study. The CAD drawing is developed for the study and furniture placement is marked, to scale, on the plan. The plan is studied on various aspects of planning including space planning, structural planning, services and interior design. The plan is modified without disturbing the functionality and area of the existing layout to ascertain that in the provided area a more functional layout can be developed and hence the exercise of value engineering shall be executed in the design phase as it affects the project cost. The original as- existing plan is compared with the amended plan and the results are analyzed. The exercise aims in keeping the existing facilities intact and keep the internal carpet area the same. A structural arrangement for the new plan is developed bringing out efficiencies achieved and locating the plumbing and other services to show how functionality has been increased.

IV. VALUE ENGINEERING

VE (value engineering) was developed at General Electric Corp. during World War II and is widely used in industry and government, particularly in areas such as defense, transportation, construction and healthcare (Senay Atabay and Niyazi Galipogullari; 2013). VE, often known as "value analysis" is the process that includes several steps to find out the best value of any process or product. A systematic procedure aimed at boosting the value of a product is known as value engineering. It focuses on increasing functionality while maintaining a low-cost structure. In construction projects, this process can be very beneficial for all the stakeholders involved. Although the process can be executed at any stage of the project, it provides the best result if done in the early stage of the project.

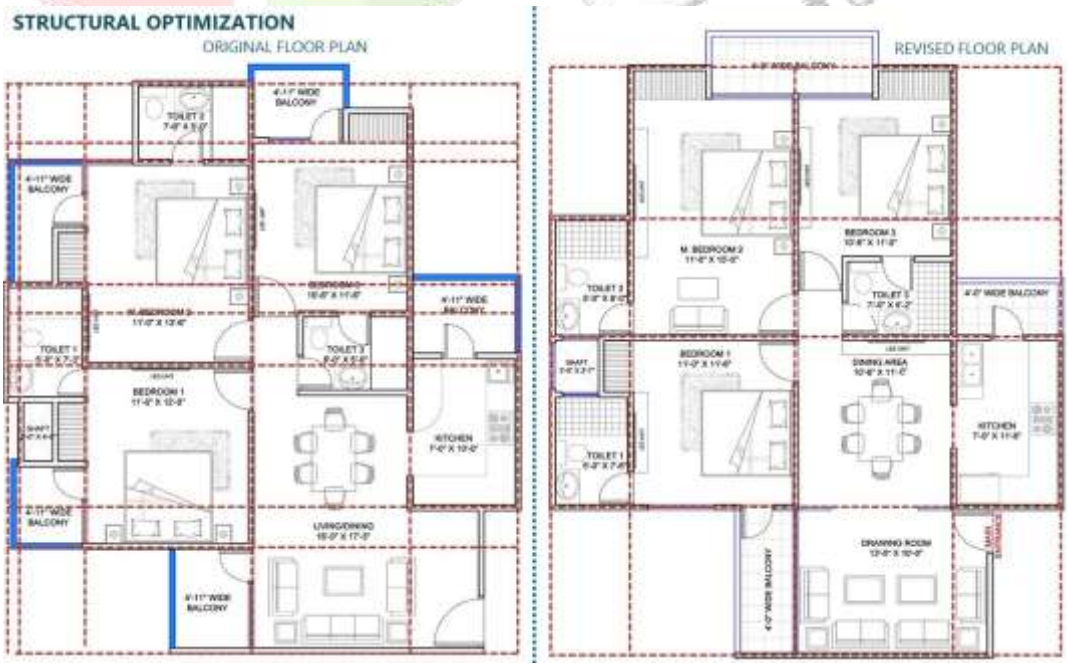
V. APPLICATION ON CASE EXAMPLE

This layout is taken as a case study from an existing residential complex in Noida to understand the process of value engineering. The layout is taken as a reference only to understand the need and application of value engineering. The built-up area of the 3 BHK+3 Toilet layout is 1450 sq. ft. and the carpet area for the same is 1142 sq. ft. In Space planning, the Irregular Wall Grid, Circulation Space and wall orientation will be taken into account, in structural planning, the Column placement is not in the Grid and in services planning the location of Shafts can be improved as all the toilets are placed at different locations. In Interior Layout planning, there is a considerable amount of dead spaces, wardrobe location is not appropriate in the master bedroom and drawing room furniture placement is not adequate. The furniture placement should be kept in mind during the planning stage of these units to make the result more functional and thus reduce the need for modifications in future.

Area	Issues
Layout	There is no grid planning in both structural and architectural layouts.
Layout	Walls are not in linear, unnecessary staggered wall placement.
Drawing Room	Dead space near the entrance and behind the seating area, in the master bedroom.
Master Bedroom	The wardrobe in front of the bed is not suitable and it does not provide space for the TV unit which is an important piece of furniture in M.B.
Toilet	All toilets are in different locations which will require separate plumbing services and are not cost-effective.
Toilet	Toilet 1 door too small
Shaft	The shaft is situated at the external façade of the building which is not appropriate from the perspective of the services
Balcony	The balcony can be clubbed for better utilization of space

Image: Exiting Layout

Image: Problem Areas in Existing Layout

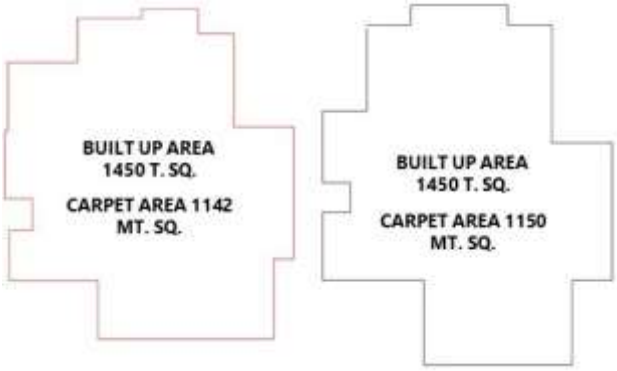


AREA	PROBLEM	REVISION
Layout	There is no grid system in the layout, all walls have different orientations.	The revised layout is the grid system
Layout	Walls are not in linear, unnecessary staggered wall placement.	The walls are in linear placement, with no irregularity
Drawing Room	Dead space near the entrance and behind the seating area.	Dead space near the entrance was removed with a more efficient furniture layout
Master Bedroom	The wardrobe in front of the bed is not a suitable interior.	Master bedroom layout with proper furniture layout and increased bedroom space
Toilet	All toilets are in different locations which will require different plumbing services and are not cost-effective.	Toilet clubbed together with common shaft.
Toilet	Toilet 1 door size too small	Toilet door size revised
Shaft	The shaft is situated at the external façade of the building with no ventilator towards the toilet- not necessary.	Shaft made utilizable by placing services of two toilets in that.
Balcony	The balcony can be clubbed for better utilization of space	The balcony is clubbed together to save space and efficient use.

Table: Layout comparison

VI. Result and Analysis

On the left-hand side is the older plan and on the right-hand side is the modified plan. This exercise aimed to increase the functionality of the layout without compromising the area or spaces in the layout. This is just one iteration and more options could be generated which will function better than the original proposed plan. This exercise hypothesis that the process of value analysis shall be applied to the project in the design stage.



Area	Original Size	Revised Size
Drawing Room	16’-0” X 9’-5”	13’-0” X 10’-0”
Dining Area	10’-6” X 7’-10”	10’-6” X 11’-7”
Bedroom 1	11’-0” X 12’-0”	11’-0” X 11’-6”
Toilet1	5’-0” X 7’-6”	5’-0” X 7’-6”
Bedroom 2	11’-0” X 13’-6”	11’-0” X 15’-0”
Toilet 2	7’-6” X 5’-0”	5’-0” X 8’-0”
Bedroom 3	10’-6” X 11’-6”	10’-6” X 11’-0”
Toilet	7’-0” X 5’-0”	7’-0” X 5’-2”
Kitchen	7’-0” X 10’-0”	7’-0” X 11’-6”
Balcony 1	4’11” Wide	4’-0” Wide
Balcony 2	4’11” Wide	4’-0” Wide
Balcony 3	4’11” Wide	4’-0” Wide

VII. Conclusion

Value Engineering attempts to provide measurable value increases for users by improving quality, improving design features and reducing costs. VE has been implemented in the building's architectural, structural, and spatial arrangement systematically. The currently existing facilities were evaluated by developing several iterations for solving the identified problem areas of the layout. It was analyzed that the value of the layout was increased and it is thus suggested that the process shall be applied at the design stage to increase the value of the layout to the maximum extent while keeping in mind the requirement of the users. There is a considerable amount of future scope in this area of study in terms of quantifying the cost reduction and identifying the constraints faced while applying the exercise at different stages.

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