



Cost Model for Construction of Hotel Projects

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Abstract: This research work aims to develop a cost model for hotel projects to determine the preliminary cost of a proposed hotel to facilitate investors and owners during the early decision-making process regarding investment in Hotel projects. The complexity and large variation in the hotel industry limits the scope of this research to develop a cost model only for the mid-scale range of hotel projects which comprises of 3 star and 4 star rated hotels. The research includes the understanding of the hotel industry, its classification, the feasibility of hotel projects, and various other parameters associated with the establishment of hotel projects. This cost model largely helps in project cost and areas optimization where every input value can be compared with a set of range of values from minimum to maximum and accordingly the rates and areas can be adjusted. It can be used for those proposed hotel projects which are in the stage of hotel feasibility analysis and this cost model can be a part of the financial analysis. It would also help in optimising the cost of the project and no of keys that can be obtained in a project by optimising and alternating the values required in the cost model and by also analysing it in terms of revenue generating parameters such as no of keys, food & beverage, banquet & meeting facilities, etc. The cost model has been developed using the case study data analysis of a similar range of hotels, and by incorporating requirements using building bye-laws and guidelines based on hotel projects. The outcome of this research will have the cost model and area programming framework for the mid-scale segment of hotel projects.

Index Terms - Hotel projects, Cost model, Preliminary Estimate, Construction cost, Area programming

I. INTRODUCTION

The tourism and the hospitality industry in India have emerged out as one key driver of growth in the services sector of India. In recent years, the hotel industry in India has witnessed massive development and growth. The hotel industry is inevitably linked to the tourism industry and the growth in Indian tourism has blossomed in to the growth of the Indian hotel industry. The fortunes of the hospitality industry have always been linked to the prospects of the tourism industry and tourism is the foremost demand driver of the industry (Chadha, 2016). The tourism and hospitality sectors are among the top 10 sectors in India to attract the highest Foreign Direct Investment (FDI) (EF&H, 2019). 100% FDI allowed in tourism construction projects, including the development of hotels, resorts, and recreational facilities, which aid in the growth and development of the hospitality sector in India. Therefore, the growth has led to a need for more and better infrastructure in the hospitality sector.

The tourism and hospitality sector is among the top 10 sectors in India to attract the highest Foreign Direct Investment (FDI) (Achin & Sanaya, 2017). With the tremendous growth in the hospitality industry, which directly contributes to India's GDP (10%), there is a high market demand for the Hotel industry. This demand arises due to various factors such as government schemes to promote tourism- Incredible India, increased number of travellers for leisure, business, meetings, incentives, conferences, and exhibitions, medical, etc. Thus, the need for hospitality infrastructure turns out to be an opportunity for investors to invest in Hotel Business.

A Cost model can enable designers and clients to appreciate how costs are distributed among the functional components of a building. The cost and area programming can help designers to achieve a balanced and logical distribution of available funds between the various parts of the building. It can also assist in cost planning of future projects by comparison of cost analysis leading to the development of a cost model. To facilitate investment decisions by the investors/owners.

II. NEED FOR STUDY

According to the hotel sector analysis report published by Equitymaster, the demand-supply gap in India is notable and there is a need for more hotels. The shortage is mainly within the mid-market and budget hotel segments since the travelers are looking for safe and affordable accommodation. The number of international brands across all hotel segments and domestic hotel chains, too, are embarking on strong expansion and development plans across all hotel segments. (Equitymaster, 2019) Construction of hotels is primarily a private sector activity that is capital intensive and has a long gestation period. Thus, developers must ensure quality planning and execution of a hotel project along with constant vigilance for compliance and an appropriate financing structure. (HVS, 2016) Therefore, with an increase in the need for hospitality infrastructure, there is an opportunity for investors to invest in Hotel Business. But there is no defined cost model or

data available for preliminary estimation of hotel projects due to its complexity and large variability. Since there is no standard format or data available based on Plinth Area rates in CPWD standard documents for preliminary estimation of hotel projects, there is a need for a cost estimating guide in an Indian scenario. This research aims to develop a cost model for hotel projects in India to facilitate investors and owners during the early decision making process regarding investment in Hotel projects.

This research is an attempt to resolve the complexity of the hotel project establishment in terms of area analysis and cost analysis of a similar range of hotels. It will also help in cost optimization and cautious decision making for investment. The cost model will also help in area programming and area allocation of different spaces in a hotel project based on the guidelines and industry norms.

III. AIM & OBJECTIVES

The aim of this research is to determine a cost model for the construction of hotel projects in India.

The objectives of this research are:

1. Understand the various classifications of hotels, typical hotel project components and categorise the construction cost of hotels in India.
2. To identify the percentage distribution of hotel spaces and its cost components using the case studies of similar projects.
3. To develop an area programming framework for hotel spaces.
4. To formulate a construction cost model for hotel projects in India.

IV. SCOPE OF STUDY

- Cost model applicability will be on similar range of hotels i.e. 3-star and 4-star rated, mid- market and upper mid-market segment of hotels projects in India.
- Land cost will be excluded from the cost data, since it will be specific to the location of site.
- Hotel feasibility, revenue model, and operation & maintenance cost of hotel projects will not be included.
- The identified cost model will not hold true for other classifications of hotels like Heritage hotels, boutiques hotels, motels, budget hotels, etc. because of the significant extent of variability.
- Case Studies will consider the actual cost incurred for the construction of hotel projects, its comparison and analysis based on the defined cost parameters.
- This cost model can be applicable to any no of hotel projects ranging from 50 to 500 keys of similar hotels.

V. LITERATURE REVIEW

This section incorporated the literature study on various parameters associated with the establishment of hotel projects, such as the Indian hotel industry, typical hotel project components, hotel classifications, cost parameters, feasibility studies of hotel projects, facilities planning and financial management of hotel projects, and cost modelling techniques. As a part of the research, a literature study has been carried out through books, standards, research papers, articles, thesis, published and unpublished papers on the subjects related to cost modelling and establishment of hotel projects.

5.1 Indian Hotel Industry

Tourism is now one of the most significant industries and is the third largest foreign exchange earner in India. It is one of the fastest growing industries. It also generates employment opportunities and is a significant source of foreign exchange for the country. The booming tourism industry has had a cascading effect on the hospitality sector with an increase in the occupancy ratios and average room rates (Equitymaster, 2019). The tourism industry and hospitality sector in India is among the top 10 sectors to attract the highest Foreign Direct Investment (FDI). The demand for hotels largely depends on business travelers and tourists for leisure. An increase in demand for medical tourism has also been observed. The rising purchasing power of the Indian middle class has aided the exponential growth of domestic tourism and helped in narrowing the gap between lean and peak seasons in the hotel industry (Equitymaster, 2019).

According to the authors, the hotel properties represent the important property investment sector that belongs to the non-residential type of real estate, have the specificities that distinguish them from the other types of real estate and require unique management expertise. Investment in hotels is a high-risk investment because the return on investment depends on both the real estate market and the tourism market, which are very unpredictable and volatile. This risk, caused by the sensitivity of investment return to the changing conditions of the local and national market economies, is systematic and not easy to manage (Newell & Seabrook, 2006). On this account, the cost model can assist in analysis the risk and investment decisions for proposed hotel projects.

5.2 Hotel Classification

The Hotel & Restaurant Approval & Classification Committee (HRACC) inspects and assesses the hotels based on various facilities and services offered as mentioned in their checklist published by the Ministry of Tourism for various classification/ reclassification of hotels. Hotel Projects are approved at the implementation stage and operational hotels are classified under various categories. The procedure to get approval for any specific classification is described in the guidelines published by Ministry of Tourism, HRACC Division. The classifications of hotels based on HRACC guidelines are divided into two major categories which are as follows:

- **Star Category Hotels:** These include hotels with star ratings such as 1 Star, 2 star, 3 Star, 4 Star (with or without alcohol services), 4 Star (with or without alcohol services), and 5 Star Deluxe.

- **Heritage Category Hotels:** These are heritage hotels set in properties such as small forts, palaces, havellis, etc. These hotels must have a minimum of 50% floor area built before 1950 with no substantial change in the original façade. These can be categorised as Heritage, Heritage Classic, and Heritage Grande.

Apart from the classifications as described by HRACC, there are other classifications of hotels based on size or no of rooms, location of hotel, clientele, duration of the guest stay, level of services provided, ownership of the hotel, market segmentation based on room tariff and facilities provided, etc. Examples: Resorts, Motels, Casino, B&B, Commercial, Suite, Time-share condominium, etc.

5.3 Hotel Feasibility

Hotels entail huge investments that are expected to generate returns over decades, and investors must pay careful attention to the planning process to avoid delays and rework. An efficiently built functional hotel may not yield a good return if built with an inappropriate positioning having a facility mix that is not in line with the current market conditions and forecasted trends. Hence, a careful assessment of the site, market trends and local bylaws must be made before determining the positioning and facilities mix of a hotel in order to ascertain the highest and best use of the real estate (HVS, 2016). This highlights the importance of a feasibility study of hotel projects. This research is based on developing a cost model which will be a part of financial feasibility of the hotel project.

The project feasibility of a hotel must be studied with all respects based on the location, available data and market trends, revenue generation streams, etc. before investing in the project. The viability of the hotel project would greatly depend on the exact location and the project costing & its profitability would vary from place to place. The financing strategy for the hotel must be well thought of. If the feasibility of the projects doesn't seem fit, it becomes difficult to convince the investor or other financiers/banks to invest in the project. Selection of Hotel operator/ brand of hotel/franchising or management contract strategies for ownership of a hotel are significant in order to establish a hotel. These impact the future revenue streams of hotel projects. Hotel O&M, revenue streams, gross operating profit are important considerations for the owner or investor in order to determine the monetary benefits.

5.4 Typical Hotel Project Components

A survey by HVS reveals that more than 60 % of all hotels with mid-market to luxury positioning have an estimated room to total area (above ground) ratio of less than 50 %. This means that more than half of the valuable floor space index (FSI) area is being utilised for building the ancillary and supporting areas of a hotel. Today, F&B outlets and meeting spaces form an integral part of hotel operations/revenue mix and serve as important selection criteria for guests. Thus, effective planning and efficient use of FSI areas is imperative and can go a long way in enhancing functionality and maximizing return on investment for a developer (HVS, 2016). The hotel development is complex in nature and great expertise is required, especially in the early stages of planning and development, which if not done properly can lead to cost over-runs and ultimately poor financial returns for the project (Achin & Sanaya, 2017). Therefore, efficient planning of hotel spaces is required which needs an understanding of the typical hotel project components. The major hotel spaces can be categorised into four groups as follows:

5.4.1 Residential Area

These include the rooms provided for the guests for lodging purposes. These are the major revenue generating areas of the hotel, contributing to 60% of the hotel revenues. Guestrooms, attached toilets, and balcony areas are a part of residential areas.

5.4.2 Public Areas- FOH (Front of House)

The FOH areas are public areas where employees deal with the customers face-to-face. These spaces include:

- Entrance & Reception
- Lobby & Lounge
- Food & Beverage: Restaurants, Dining, etc.
- Function rooms – Ball rooms, Banquet halls
- Meeting/ conference rooms
- Gymnasium & Spa
- Swimming pool, etc.

5.4.3 BOH (Back of House) Areas

Back of house areas are hidden from the guests. These are used for the back of house services for the functioning of the hotel. Separate consultants are required for the integration of these services. These include areas such as:

- Service entrance
- Kitchen – food preparation area
- Employee areas – Locker rooms
- Laundry area
- Housekeeping
- Storage areas
- Locker rooms
- Administration, offices, etc.

5.4.4 MEP Areas

Building services are one of the most necessary elements for the functioning of the hotel. Each of these must meet the requirements and specifications as per norms and standards. These include:

- Electrical
- Plumbing
- HVAC
- Fire and Life safety
- Lifts
- Building Automation system

5.5 Hotel Cost Components

According to the cost survey done by HVS on Hotel development, the major parameters considered were Land cost, building and site improvement cost, FF&E, and Pre-opening and working capital to obtain the total cost of the project for each hotel category. A number of factors determine the budget for the construction of a hotel which varies from project to project. The breakup of the development cost of a hotel can be done into the following categories:

- Land Cost
- Construction costs
- Mechanical, electric and plumbing (MEP)
- Furniture, fixtures and equipment (FF&E)
- Soft cost
- Pre-opening cost and Working capital
- Interest during construction (IDC).

5.5.1 Land Cost

Cost of land acquisition which will be location specific. Therefore, this component is not included in the development cost of the project, and can be added separately.

5.5.2 Construction Cost

The building construction cost will include the civil works, hardscape/ external development works including landscaping work, façade work, interior finishing work, signage, etc.

5.5.3 Mechanical, electric and plumbing (MEP) Cost

These include all the works associated with building services such as electrical, plumbing, fire-fighting, HVAC, and Building automation system. It also includes the Specialized Equipment's that are specific to hotel projects such as lifts, kitchen equipment, laundry equipment, gym equipment, IT equipment, Audiovisual (AV) equipment, and security equipment, etc.

5.5.4 Furniture, Fixtures and equipment

Furniture, Fixtures and equipment (FF&E) includes all non-permanent, removable items at the hotel property, such as guestroom furnishings, kitchen equipment, and other items of decoration. It includes items such as lighting, carpet and artwork, furniture and case goods, beds, mattress, minibar, safes, etc. These items are allocated considerable amount of budget in the hotel estimate.

5.5.5 Soft Costs

The soft cost includes the items that are necessary for construction but generally are not a part of the construction contract which includes material and labour. It includes the consultant's fees, legal and approval fees, liasioning, etc. Professional and legal fees, Project management fees, consultant fees, regulatory fees, licenses, etc.

5.5.6 Pre-opening Cost and Working Capital

The pre-opening costs include expenses such as marketing, staffing, training, and administrative expenditures. Operating supplies and equipment include the small equipment that is needed for the hotel's operation, such as chinaware, linens, silverware, uniforms, engineering tools, etc. These also include items such as hairdryer, iron, hangers, towels, dishes and glassware. The working capital includes a working capital reserve to maintain adequate cash flow until the operation reaches a break-even point.

5.5.7 Interest during construction (IDC)

It is the interest that accumulates on a loan that finances the construction of a building or any development. The IDC is calculated until the project begins to generate revenue, when the company financing the project begins to service its debts.

5.6 Cost Modelling Techniques

Cost estimation models used to estimate the costs of a product or project. The results of the cost models are considered into business plans, budgets, and other financial planning and tracking process. Cost models have been found to be a useful tool, it can be used as a financial representation in the form of a spreadsheet, mathematical expression, chart, and/or diagram used to illustrate the total cost of families of systems, components, or parts within a total complex product, system, structure or facility (Egwunatum I. Samuel, 2015). The approximate costs are prepared based on unit costs of major cost components established by a survey of costs of similar cost components in completed projects. In this research, the focus is on developing a parametric model for preliminary cost estimation of hotel projects. Cost estimation is most unpredictable in construction projects during the early stages of project inception. Early cost planning and estimation response to construction projects cost volatility assure the great success of the project (Samuel & J. Snapp, 2015). The cost

models can be used to determine the cost of proposed construction projects. These models can be applicable at either at the conceptual stage, feasibility stage, budget authorization stage, control stage or bidding/tendering stage. For preliminary estimation work of hotel projects, parametric estimation method, also called statistical modeling will be used for cost model framework formation by analyzing the historical data of similar projects. The comp-set strategy will be used to club projects with similar characteristics to obtain a similar range of values.

VI. RESEARCH METHODOLOGY

Total ten case studies of existing hotel projects have been collected and analysed in terms of areas and cost to develop the cost modelling and area programming framework. The process of analysing each of the case studies is mentioned in the methodology chart in Figure. 6.1. The research methodology involved for analyzing the case study projects are as follows:

1. Selection of Case study projects as per the scope of work.
2. Area programming and analysis of selected case study projects to identify the major area components of the projects.
3. Segregation of areas based on FOH- Front of house, BOH- Back of house, MEP services, landscaping, and site services.
4. To identify the percentage distribution of areas in each project.
5. To identify and segregate the project cost details.
6. Analysis of project cost based on project areas.
7. Percentage distribution of cost categories.
8. To obtain cost per sq.m. of plinth area and cost per room
9. Area and cost summary of case study projects.
10. Determination of framework for the cost model.

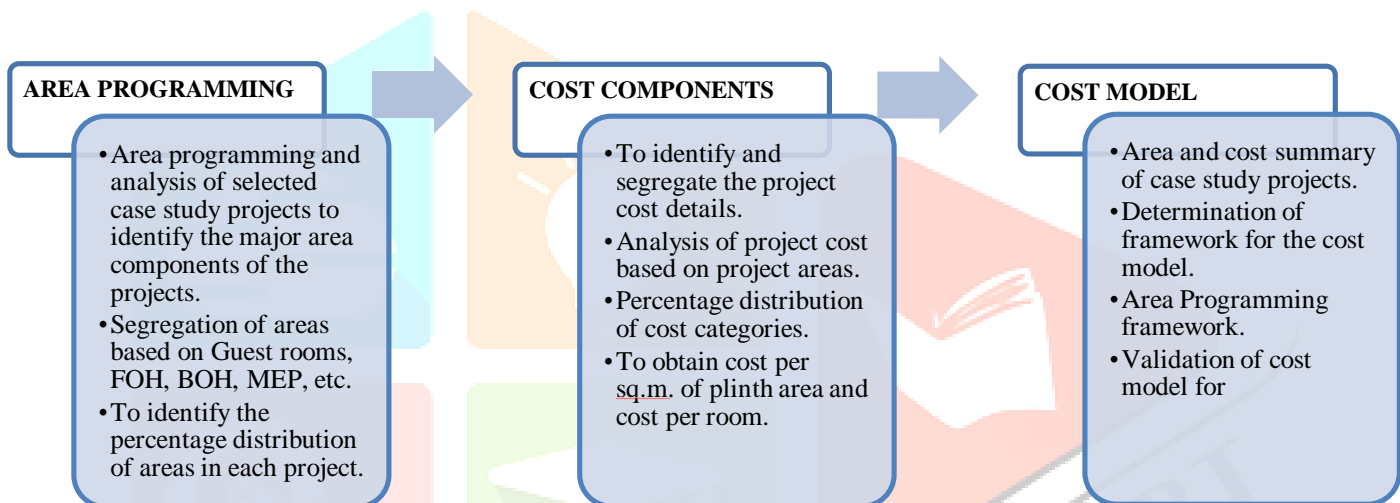


Figure 6.1: Methodology for Case Study Analysis

VII. CASE STUDY ANALYSIS AND RESULTS

For this study, the case study data collected for the study were from secondary sources. The analysis of this research is based on the secondary data analysis of existing hotel projects of the mid-scale market segment. The case study projects belong to midscale market segment hotel chains of various brands of hotels such as Fairfield and courtyard, Hyatt Place, Holiday Inn, Novotel, Ramada, etc. The number of keys in the selected hotel project is ranging from 100 to 350. These case studies have been analyzed and the results were used to formulate the cost and area programming framework.

The parameters for area and cost analysis have been obtained from the literature review. The results of the case study analysis and summary based on project cost and project areas are as follows:

7.1 Area Analysis and Summary

The case studies have been analyzed based on the methodology described above. Table 7.1.1 shows the percentage distribution of all the major spaces in a hotel in the case study projects. The Mean and range of each of these spaces distribution will be used in the area programming framework of hotels. According to this table, approx. 75% of the area is constituted by guest rooms and FOH public areas. Guestrooms constitute the maximum area allocation in any hotel project.

Table 7.1.1: Case Study Area Distribution Summary

S.No.	Hotel Spaces	CS01	CS02	CS03	CS04	CS05	CS06	CS07	CS08	CS11	CS12	Mean	Range
1	Guest rooms area	47.3%	62.9%	43.3%	49.4%	56.2%	46.2%	38.7%	36.4%	50.3%	41.1%	47.2%	36% - 55%
2	FOH area	32.2%	14.5%	30.1%	27.9%	21.5%	34.3%	31.4%	31.5%	25.3%	30.8%	28.0%	20% - 35%
3	BOH area	14.0%	14.1%	14.0%	13.7%	6.8%	10.5%	17.7%	21.1%	15.5%	20.0%	14.7%	11% - 20%
5	MEP area	6.4%	8.6%	12.6%	9.0%	15.5%	9.1%	12.3%	11.1%	8.9%	8.0%	10.1%	6.5% - 12%
	Total Area (GFA)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The comparison of hotel space distribution in the case studies mentioned above are as mentioned in the Figure.7.1.2. The mean values of each space distribution are obtained based on which the area programming of proposed hotel projects can be obtained.

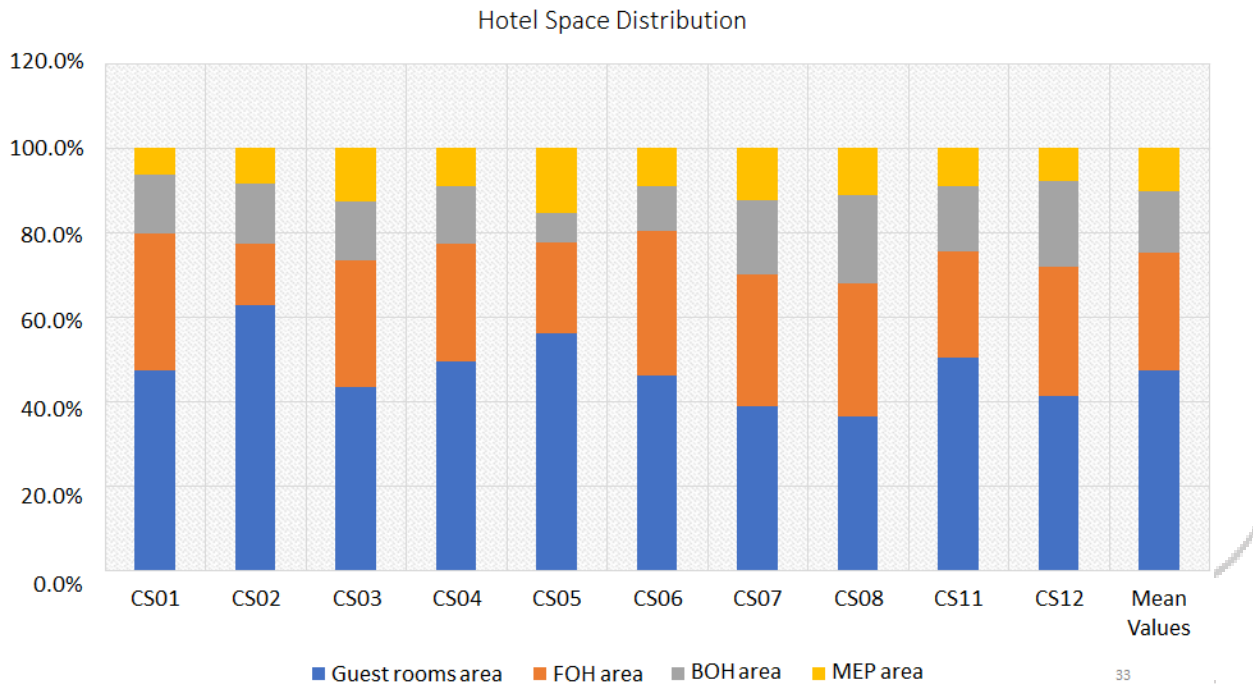


Figure 7.1.2: Case Study Area Comparison

7.2 Cost Analysis and Summary

Table 7.2.1 represents the cost summary of all the case study projects. According to this table, the cost per key of the hotel varies from 30 lakhs to 80 Lakhs per key for 3-star to 4-star rated projects and the cost per sq.ft. of the gross floor area of respective case studies is also included.

Table 7.2.1: Hotel Case Studies – Cost Summary

S. No.	Case Study Project	Location	Keys (rooms)	Project Cost (INR)	Project Cost (in Cr)	Cost Per key (Lakhs)	Tot Built-up area (sq.m.)	Tot Built-up area (sq.ft.)	Cost Per sq.m. (Rs)	Cost Per sq.ft. (Rs)
1	CS01	Bangalore	336	1,507,299,988.00	150.73	44.86	20482.97	220396.76	73,587.96	6,839.03
2	CS02	Gurgaon	176	906,439,525.21	90.64	51.50	8916.32	95939.60	101,660.72	9,448.02
3	CS03	Coimbatore	126	473,543,601.04	47.35	37.58	8100.59	87162.35	58,457.91	5,432.89
4	CS04	Chennai	153	538,682,278.13	53.87	35.21	7589.61	81664.20	70,976.28	6,596.31
5	CS05	Ahmedabad	184	1,488,221,000.00	148.82	80.88	10749.47	115664.30	138,445.99	12,866.73
6	CS06	Goa	185	1,310,142,572.00	131.01	70.82	11494.69	123682.86	113,978.07	10,592.76
7	CS07	Madurai	96	560,682,054.00	56.07	58.40	7340.88	78987.87	76,378.04	7,098.33
8	CS08	Noida	194	1,193,923,018.00	119.39	61.54	20275.46	218163.95	58,885.13	5,472.60
9	CS09	Chennai	176	529,527,631.00	52.95	30.09	6,400.00	68864.00	82,738.69	7,689.47
10	CS10	Bangalore	526	1,994,763,381.00	199.48	37.92	23,760.00	255657.60	83,954.69	7,802.48

The total costs of each case study have been segregated in terms of major cost components of hotel and a comparative distribution of each has been represented in the graph in Figure 7.2.2. The graph also represents the relation between each cost component in all the case studies represented above and an average value of each cost component which will further be used in the cost model.

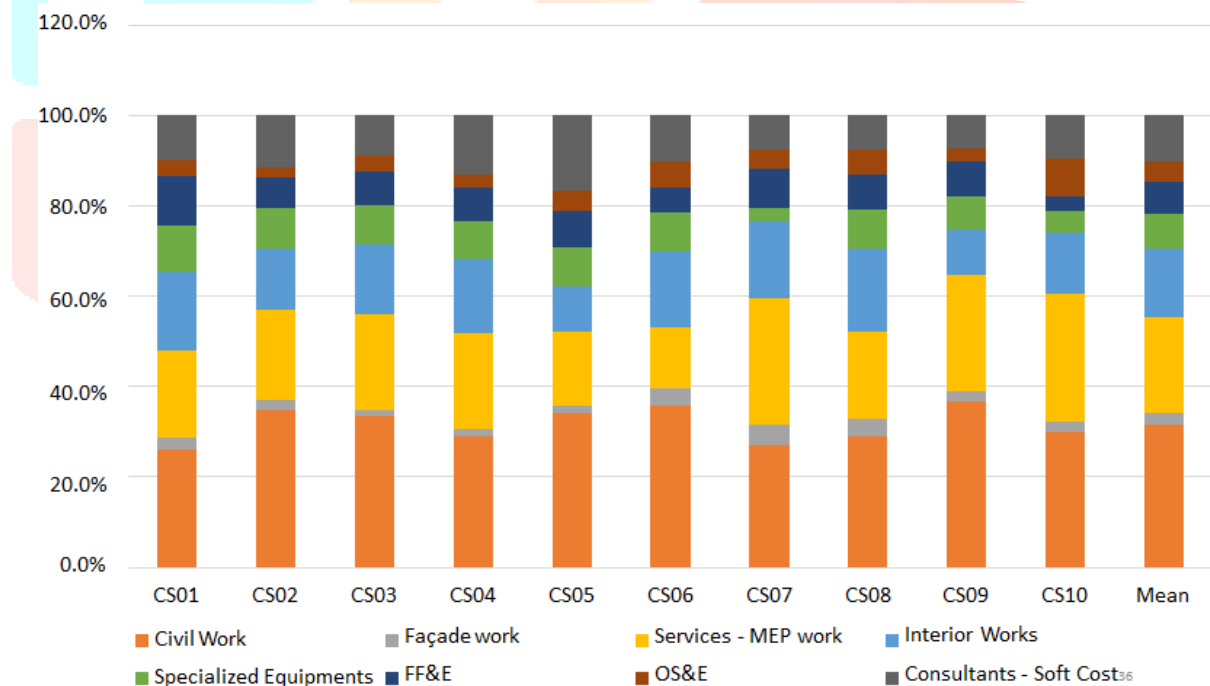


Figure 7.2.2: Cost Distribution in Case Study Projects

The distribution of cost components and area components of a hotel project are summarized in the Figure. 7.2.3 given below.

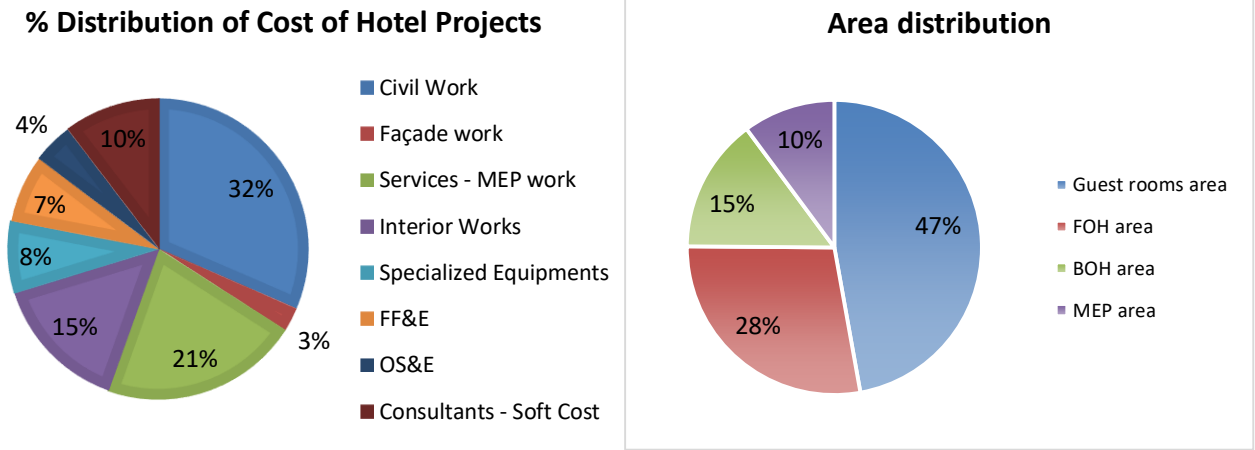


Figure 7.2.3: Percentage Distribution of Cost and Area components of Hotel Project

In Figure 7.2.4 the graph represents the cumulative data on cost per key and cost per sq.ft. of GFA based on the cost analysis of the case studies done above. By arranging the data in decreasing order of cost per key, a linear relationship can be observed between the Cost per Key and Cost per sq.ft. GFA for a specific no of keys in the case study projects.

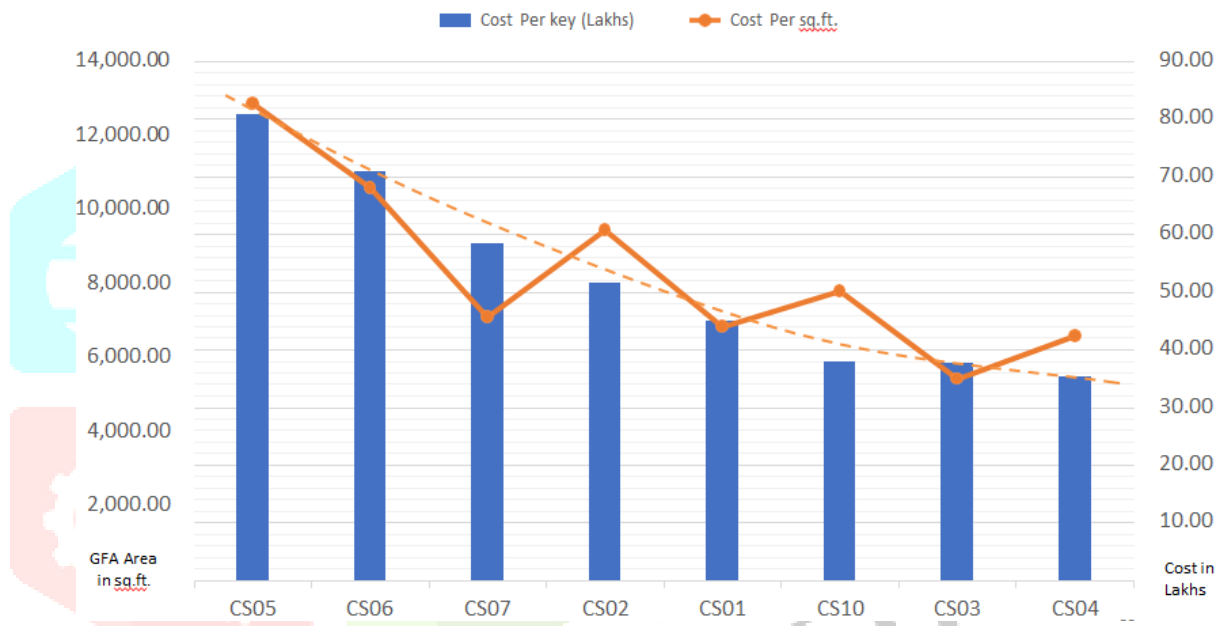


Figure 7.2.4: Hotel Cost per Key and Cost per sq.ft.

PARTICULARS	COST %
1. Land Cost	(Excluded)
2. Building Construction costs	75 - 78%
1. Civil Work	29 - 34%
2. Façade Work	2.2 - 4.5%
3. Services – MEP Work	18 - 20.6%
4. Interior Works	12.2 - 16.4%
5. Specialised Equipments	8.0 - 9.5%
3. Furniture, Fixtures and Equipment (FF&E)	6.8 - 7.6%
4. Operating Supplies and Equipments (OS&E)	3.2 - 4.7%
5. Consultant's - Soft cost	10 - 11%
6. Pre-opening cost and working capital	1.8 - 3.5%
7. Interest during construction (IDC)	5-10%

Table 7.2.4. Range of Cost Components of Hotel Projects.

The cost categories identified are Land cost, building construction cost, soft cost, cost of furniture fixtures and equipment's and cost associated with operating supplies and equipment, pre-opening costs and working capital required to start the functioning of hotel projects. Table 7.2.4 shows the range of percentage distribution of various cost components in a mid-scale scale Hotel project.

VIII. COST MODEL

For Hotel projects, Cost Model can be used for the following:

- Construction cost estimation of projects.
- To identify cost distribution among various functional components of a building.
- Financial feasibility analysis of a hotel project.
- Cost planning and optimisation of proposed hotel projects.
- To facilitate investment decisions by the investors/owners.

8.1 Cost Model Parameters

The framework for hotel case study data collection and evaluation has been established based on the data collected in terms of areas and cost of each component in the case study projects in the previous section. The cost model will be formulated as described in the Figure 8.1. For developing a cost model, there will be three types of parameters based on the values to be inserted or obtained. The parameters will be input, output and fixed parameters. The input values will be provided as per the requirement to obtain a certain output or result. The data obtained from the case studies will be used to formulate the cost model parameters.

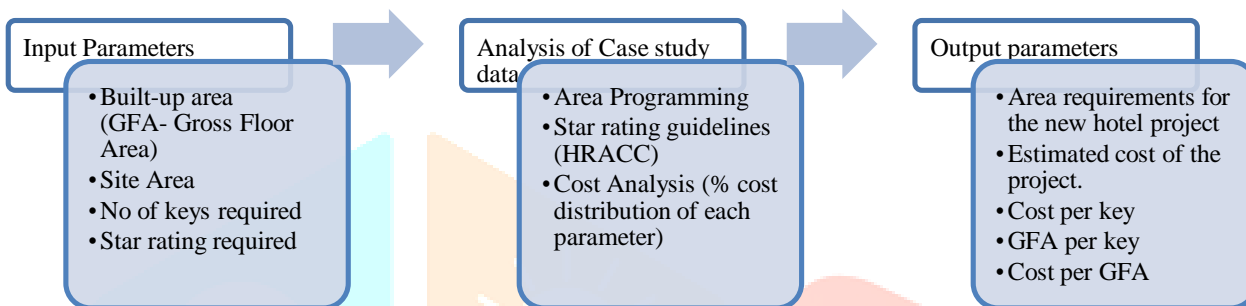


Figure 8.1: Framework for cost model formation

The cost model parameters are as follows:

8.1.1 Input Parameters

These parameters will be manually filled up in the cost model. The following are the input values required in the cost model:

- Plot area, type of hotel and required star rating.
- Byelaws: FAR, Ground coverage and building height based on the location of the hotel and plot area.
- Values for number of keys and average room sizes will be obtained from the built-up area and gross floor area calculation.
- No of keys and area per room can be adjusted between minimum and maximum values to obtain no of rooms required and design optimization.
- Values required from the given set of range, otherwise calculations will pick up the mean values which fixed data obtained from case studies. This applies for both areas and cost calculations.

8.1.2 Output Parameters

These are the values received in return after the input values are provided. These parameters are the output data obtained in the cost model. Input parameters for cost model and output will result in terms of GFA required to build a hotel with certain number of rooms and associated facilities and amenities. Output parameters can be:

- Area requirements and distribution in the proposed hotel project.
- Capacity calculation results.
- Cost distribution of the project.
- Total Cost of the project
- Cost per Key, Cost per GFA, etc.

8.1.3 Fixed Parameters

These contain the fixed values obtained from the working sheets of cost and area analysis of hotel case study projects. These are to be modified only if the values are required to be modified from the given range of values. Fixed parameters can be:

- Percentage distribution of each cost component.
- Percentage distribution of hotel spaces.
- Percentage distribution of types of hotel rooms & suites.
- Values and units of cost dependent variables.

Since the requirements of hotel byelaws vary as per the location of the project, it is necessary to follow the byelaws to obtain the values of floor area ratio, ground coverage, building height and parking requirements. Further calculation for the project cost and area are to be done as per the permissible areas and building height.

Note: To understand the cost model calculations with input and output values, it is explained by taking an example of a proposed hotel project with 2500 sq.m. plot area located in Gurgaon to be developed for a 3 star rating.

8.2 Calculations for No of Keys (rooms)

Values for number of keys and average room sizes will be obtained from the built-up area and gross floor area calculation. The no of keys and area per room can be adjusted between minimum and maximum values to obtain the total no of rooms required with average guestroom size for design optimization. The Minimum values for the proposed star rated project must be checked from HRACC guidelines.

Table 8.2.1: Methodology for Case Study Analysis

No of Keys Calculation							
	Hotel Specs	Unit	Option-01	Option-02	Option-03	Option-04	Selected Parameters
1	No of keys	Nos	105	110	134	102	105
2	Avg guest room size	Sq.m.	28	26.8	22	28.90	28
	Total Guest room area	Sq.m.	2948.04	2948.04	2948.04	2948.04	2948.04

8.3 Project Cost Framework

The total cost of the project can be obtained from the calculations given below in Table.8.3.1. Project Cost breakup as per percentage division of each cost component obtained in the previous chapter is used here for calculation and are mentioned in the Table 8.3.2. Alternate cost working of the project cost is obtained in Table 8.3.3 based on the range of values obtained from the cost dependent variables in each of the case studies.

Table 8.3.1: Project Cost Summary

Project Cost Details - Cost Summary							
S. No.	Cost Details	Value	Unit				
1	Total Project Cost	58,01,31,877.61	INR				
		58.01	Cr				
		Project Cost		3 Star Hotel		4 Star Hotel	
2	Cost per GFA	86,546.26	INR/sq.m.	76,170.72	INR/sq.m.	96,921.81	INR/sq.m.
		8,043.33	INR/sq.ft.	7,079.06	INR/sq.ft.	9,007.60	INR/sq.ft.
3	Cost per Key	55,10,001.00	INR/Key	42,28,829.55	INR/Key	67,91,172.44	INR/Key
		55 Lakhs	INR/Key	42 Lakhs	INR/Key	68 Lakhs	INR/Key
4	GFA per Key	65.88	sq.m./key	56.38	sq.m./key	75.38	sq.m./key
		708.89	sq.ft./key	606.64	sq.ft./key	811.13	sq.ft./key

The Gross Floor Area per key in a 3 Star hotel ranges from 45-55 sq.m. Per key and in 4 star it ranges from 65-75 sq.m. per key. The difference in sizes of rooms and other spaces, provision of suites, Restaurants and Swimming pool causes the difference in the cost of a 3 star and a 4 star project. These calculations are only for preliminary estimation purposes. The cost of establishment of any hotel would be based on its specific characteristics, requirements, and design parameters, and thus the actual cost would only be obtained after a detailed estimate considering all parameters.

Table 8.3.2: Project Cost Breakup

Project Cost Breakup							
S.No.	Cost Breakup	% cost	Min value	Max value	Value Considered	Total Cost	Total Cost
		%	%	%	%	INR	In Cr
1	Building Construction Cost	74.82%			74.82%	43,40,70,247.67	43.41
1a	Civil Work	31.46%	29.1%	33.9%	31.46%	18,24,97,274.79	18.25
1b	Façade work	2.61%	3.2%	4.9%	2.61%	1,51,54,603.66	1.52
1c	Services - MEP work	21.35%	20.6%	18.0%	21.35%	12,38,84,590.81	12.39
1d	Interior Works	14.82%	16.4%	12.2%	14.82%	8,59,95,526.34	8.60
1e	Specialized Equipment's	7.79%	9.9%	8.7%	7.79%	4,51,85,110.36	4.52
2	FF&E	7.31%	7.6%	6.8%	7.31%	4,24,06,826.62	4.24
3	OS&E	4.36%	3.2%	4.7%	4.36%	2,52,77,335.40	2.53
4	Consultants - Soft Cost	10.30%	9.9%	10.7%	10.30%	5,97,30,609.63	5.97
5	IDC	6.86%			6.86%	3,97,81,620.69	3.98
6	Pre-opening cost	2.86%			2.86%	1,66,02,199.77	1.66
	Total Cost of Project	100.00%	100.0%	100.0%	100.00%	58,01,31,877.61	58.01

By considering the calculations based on individual cost components as shown in Table 8.3.3, the cost of each cost component can be obtained by cost dependent variables and its value from a defined range of values for cost optimisation. These values have been obtained from the case study analysis data. In this alternate costing method, the total cost of the project turns out to be 55.5 crores, whereas the cost calculation based on parametric estimate of the cost per key is calculated to be 58 crores. Therefore, the cost of a project can be optimized as per the requirement.

Table 8.3.3: Cost Breakup: Alternate Cost Working for each component

Cost Breakup: Alternate Cost working for each component							
S. No.	Cost Heads	Cost Dependent Variable		Cost (INR)	Range of values (INR)		Total Cost (INR)
		Type	Value	Per Variable type	Minimum	Maximum	
1	Building Construction Cost	Unit: sq.m./ Nos / %					
1a	Civil Cost	Per GFA area	6250	27,318.22	19,337.95	40,618.67	17,07,38,873.86
	Structural Work	Per GFA area	6250	21,920.67	16,770.77	30,503.84	13,70,04,185.02
	External Development work	Per external area	1750	5,046.79	4,329.10	7,316.13	88,31,890.13
1b	Façade Work	Per Façade area	3698	6,117.41	3,595.74	9,921.36	2,26,23,534.77
1c	Services - MEP work	Per GFA area	6250	16,638.75	13,683.24	21,564.60	10,39,92,199.43
	Electrical	Per GFA area	6250	6,738.52	5,188.12	10,032.13	4,21,15,732.72
	Plumbing	Per GFA area	6250	2,334.31	2,334.31	2,334.31	1,45,89,448.14
	Fire Fighting	Per GFA area	6250	1,704.27	1,233.84	2,057.09	1,06,51,704.94
	HVAC	Per GFA area	6250	4,269.14	3,055.66	4,745.48	2,66,82,113.80
1d	Interior Works	Per GFA area	6250	12,716.19	10,855.06	14,577.31	7,94,76,157.86
	Guest Room Interior	Per Guestroom area	2948.04	14,479.84	12,975.16	15,081.72	4,26,87,125.57
	FOH- Public area Interior	Per Public area	1747.08	16,225.66	10,603.25	22,366.19	2,83,47,564.56
	BOH Interior	Per BOH area	920.80	10,110.22	6,701.54	15,791.36	93,09,526.57
	Signages	Per GFA area	6250	241.31	196.23	263.85	15,08,180.94
1e	Specialized Equipment's	Per Key	105	4,46,428.60	3,89,805.82	6,16,224.88	4,70,03,160.87
	Lifts	Per Lift	3	24,07,066.26	16,57,496.75	31,56,635.76	76,02,988.83
	Kitchen	Per Key	105	1,44,557.97	2,01,495.41	1,01,854.89	1,52,20,085.42
	Laundry	Per Key	105	6,502.96	5,437.91	7,944.56	6,84,678.02
	Gym	Per Key	105	16,700.38	10,073.59	33,267.35	17,58,333.77
	IT Equipment	Per Key	105	1,32,507.75	1,17,852.85	1,43,498.93	1,39,51,353.13
	AV Equipment	Per Key	105	30,244.16	20,336.04	43,454.98	31,84,318.85
	Security Equipment	Per Key	105	51,263.77	23,162.14	1,07,467.01	53,97,411.85
2	FF&E	Per GFA area	6250	6,908.36	5,071.65	8,137.20	4,31,77,240.01
3	OS&E	Per Key	105	2,32,454.30	1,27,542.04	3,37,366.56	2,44,74,432.83
4	Consultant's - Soft Cost	On project development cost	11%	58,01,31,877.61			6,34,65,176.85

8.4 Project Area Framework

The area requirements of various spaces of the hotel project can be obtained from the Table 8.4.1. The capacity calculations for various spaces such as guest rooms, Banquet hall, meeting rooms, dining, restaurant, manning, no of lifts, etc. are required to be done separately.

Table 8.4.1: Project Area Details: Summary

Project Area Details - Area Summary						
	Area Breakup	% Mean area	Range	Selected value	Area Required (sq.m.)	Area Required (sq.ft.)
	GFA (without parking)	100.00%			6250	67250.00
1	Guest Rooms Area	47.17%	36% - 55%	47.17%	2948.04	31720.89
2	Public – FoH Areas	27.95%	20% - 35%	27.95%	1747.08	18798.61
3	BoH Area	14.73%	11% - 20%	14.73%	920.80	9907.84
4	MEP Area	10.15%	6.5% - 12%	10.15%	634.08	6822.66

The calculation for total no of guestrooms can be obtained from Table 8.4.2 where different types of rooms with required areas can be calculated. A standard hotel contains different types of rooms and suits as required. Similarly, calculations for restaurant, dining, banquet and meeting halls, etc. can also be calculated. The distribution of hotel rooms and area calculations can be obtained as follows:

Table 8.4.2: Guest Rooms Area Calculations

Guest Room Details							
S.No	Type of room	Description	Distribution of rooms	Room count (Nos)	Room areas Range (sqm)	Area per room (sqm)	Total Area (sqm)
	STANDARD ROOMS	95.0%	90 to 95%	100			
1	Type 01 Standard Rooms	Standard King	56.5%	57	23 - 28	26	1469.33
2	Type 02 Standard Double	Twin Room	26.0%	26	24 - 28	26	676.15
3	Type 02 Standard Accessible	Disabled room	1.5%	2	28 - 34	28	42.01
4	Type 03 Deluxe Rooms	Premium rooms	16.0%	16	30 - 35	32	512.12
	Total		100.0%				
	SUITES	5.0%	5 to 10%	5			
5	Type 05 Junior Suite	Standard	70%	4	42-55	42	154.77
6	Type 05 Master Suite	Executive	30%	2	56-75	56	88.44
			Total rooms	105	Average Room Size	28.0	2942.83
	Note: Only the type of rooms required to be filled.				The average room size has to match the initial calculation done in Table 8.2.1 for no of rooms in the beginning.		
	Total Area	2942.83	Sq.m.				
	No of Rooms	105	Nos				

The summary of area calculation of each space associated with FOH, BOH and MEP areas can be obtained from the Table 8.4.3.

Table 8.4.3: Area Distribution of FOH, BOH and MEP areas.

Public Areas - FOH Area Details		
Space description	% distribution	Area (sq.m.)
Entry Lobby/ Reception	6.8%	118.62
Washrooms	3.1%	54.44
Guest Lift and Lobby	5.5%	95.34
Guest Corridor	23.9%	417.86
Staircase	14.6%	254.70
All day dining and bar lounge	12.3%	214.49
Speciality Restaurant	6.8%	119.37
Spa	2.2%	38.89
Gym	2.6%	45.27
Pre-function area	4.8%	83.24
Banquet Hall + meeting room	17.5%	305.74
Executive lounge	Extra	
Swimming pool+ deck	Extra	
TOTAL FOH AREA	100.0%	1747.08

BOH Area Details		
Space description	% distribution	Area (sq.m.)
Admin and Support	16.9%	155.21
Front Office	2.7%	25.04
Kitchen Areas	22.1%	203.50
Laundry & Linen Areas	5.8%	53.19
Staff Cafeteria	3.2%	29.47
General Store	5.3%	49.21
Lockers Area	7.7%	71.07
Liquor & Banquet Store	2.6%	24.40
Garbage handling	2.1%	18.92
Room Service	4.3%	39.54
Service Lift and Lobby	8.3%	76.84
Corridor/ Circulation	16.5%	151.93
Receiving dock	2.5%	22.85
TOTAL BOH AREA	100.0%	920.80

MEP Area Details		
Space description	% distribution	Area (sq.m.)
Plumbing Plant room and water tanks	38.5%	244.36
Maintenance Rooms	4.9%	31.30
STP and WTP	18.2%	115.31
HVAC Plant room, Fan room	17.2%	109.06
LT Panel and Electrical room	14.7%	92.99
UPS Room	2.1%	13.34
CCTV and IT Room	1.9%	12.01
Service rooms	2.5%	15.66
DG and Sub-station area	Extra	
TOTAL MEP AREA	100.0%	634.08

The main difference between 3 star and 4 star hotels is that 3 star hotels typically don't have suites whereas 4 star hotels have both rooms and suites as per HRACC guidelines. 4 star hotels will have more room options than 3 star hotels since they also offer suites. 4 star hotels offer more luxury than 3 star hotels and offer high-quality service and comfort. They also provide fine dining, bars, swimming pool, lounge, spa, gym, fitness center, concierge services, extensive business facilities, multiple restaurants and valet parking. Another difference is in the Manning requirements of hotels. Manning is the total staff in a hotel including General Manager. Manning in 3-star hotels is 0.5 to 0.8 people per key and in 4-star it will be 1 to 1.2 per key. This has impact on BOH and staff area planning of hotel projects, which in turn will increase the cost per key of hotels.

Various parameters associated with formulating cost model were divided into input and output parameters. These parameters would give the required data specific to a proposed hotel project with detailed calculations of each capacity, associated cost and areas. The individual calculations for obtaining cost and areas can be optimized as required by alternating the values of each component by manually inserting the data.

IX. DISCUSSION AND CONCLUSION

In this research work, the cost model is generated for 3 star and 4 star rated hotel projects which can be useful for preliminary estimation of the project. This model is formulated to be used for reference to have an idea about hotel spaces distribution and cost distribution of various cost components. According to a survey report published by HVS, providing the overall development cost estimate for a positioning highlights the need for an investor to be cognizant of the many variables that may influence it. Development costs can also be evaluated based on various facilities provided, built-up area, interest during construction for project loans, etc. As per the observed results regarding construction cost of surveyed hotel projects, the development costs must not be evaluated on a per square foot basis only, but rather analyzed alongside the facilities mix of the hotel (HVS, 2016). Hotel development is complex in nature and solid expertise is needed, especially in the early stages of planning and development, the lack of which can result in cost over-runs and ultimately poor financial returns for the project. Several project post-mortem discussions highlight that complex and long projects, such as hotel development, require a sound understanding of the end product. It is, therefore, time that developers take notice of the benefits of cohesive project planning and designing to limit the number of unfeasible projects that have already been floating in the market (Achin & Sanaya, 2017).

The investor can make an optimal decision by applying the proposed framework as per available data, which will facilitate the decision-making process focused on the selection of an appropriate hotel construction project to invest in and reduce the risk of making a bad decision. The issue of the selection of any hotel construction project to invest in is paramount since the decisions regarding the investment will lead to the return of the invested financial resources, as well as to a future business operation success. Since each project is unique, exact value of total cost of a project cannot be obtained pertaining to various factors and the project's specific requirements. However, these calculations can assist people for preliminary estimation of hotels and can be a checkpoint while developing the project-specific requirements.

X. ACKNOWLEDGMENT

I would like to thank Dr. Prof. V.K. Paul for giving me an opportunity to work on this topic and for his constant support to go ahead with the research work. I would also like to express my gratitude towards my guide, Maj. Gen. Taran Sidana (Retd.) for his guidance and support. His explicit comments and critical questioning helped me to carry out this research work successfully.

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