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STUDY OF CONSULTANTS INVOLVED IN PLANNING AND DESIGNING OF PRIMARY LEVEL HOSPITAL

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Abstract: A Study of Consultants involved in planning and designing the primary level hospital in Nepal is done to find out the perception of consultants on the ranking of various important factors required in hospital planning and designing, SWOT analysis of the consultant, assessment of existing qualifications of consultants and to find out the various training to enhance their existing capabilities for planning, designing, and implementation of the primary level hospital.

Top-five ranked important factors to be considered while planning and designing primary hospitals are linkages between different departments, complying with standards, multi-hazards resilient design, mandatory site visit, and universally accessible for disabled, child and gender friendly.

The SWOT analysis showed that the consultant's strengths to plan and design the primary level hospital is they have - their significant general experience, effective network of professionals, competent Human Resources, strong team, and general knowledge of standards and guidelines, and their weaknesses are - demand of high remuneration by the experts, lack of inhouse expert for electrical/sanitary/HVAC, lack of specific training related to health services design and limited case studies. Working with multi-stakeholders, areas/scope of improvement in current codes & practices for health infrastructure, innovative ideas, and concepts, and capacity enhancement opportunities at local levels are the opportunities for them despite some threats like frequent changes of officials at the local level, delay in procedures resulting in confusion and additional works, social/economical/political influences, lack of supportive role from the local level, and their awareness level.

The top three very important training for the consultant is training on relevant standards and guidelines, multi-hazard resilience, and conceptual/detailed architectural planning.

The existing capacity of the consultants should be enhanced by initiating training by the concerned authority like MoHP in coordination with relevant stakeholders. Whereas, the orientation and awareness program at the local level regarding existing guidelines and standards on health infrastructure development and construction is inevitable.

KeyWords - SWOT, Capacity, Primary Hospital, Training, Consultants, Local Level

I BACKGROUND

The construction industry is vital for the development of any nation. Construction project development involves numerous parties, various processes, different phases and stages of work, and a great deal of input from both the public and private sectors, with the major aim being to bring the project to a successful conclusion (Oke et al., 2016).

The construction of hospitals in Nepal is one of the major infrastructure projects that the Government of Nepal (GoN) sanctioned the budget for the Ministry of Health and Population (MOHP). MoHP works to improve the health facility network across the country. The MoHP has been implementing health infrastructure development through different agencies at all levels by issuing standard designs, and guidelines for design, construction, and monitoring frameworks.

Local-level under local level act 2017 and Nepal Integrated Health Infrastructure Standards (NHIDS,2017) delegate the authority to the local for the implementation of the primary level hospitals (B1, B2, and B3) under their jurisdictions.

1. 1 Statement of Problem

The government of Nepal in the fiscal year 2020/2021 (2077/78) has planned and sanctioned the budget for planning, and designing different types of primary level hospitals in two hundred ninety-six local levels across the country (MoHP, 2020). Local-level have to implement the project either from their technical human resources or hired human resources through consultancy services. MoHP has allocated the budget in Annual Workplan and Budget (AWPB) from this current Nepali fiscal year to implement the 5, 10, and 15-bedded primary level hospitals.

1.2 Research Questions

Few research questions have been developed for this research is addressing the issues and problems discussed in the previous section as follows:

- What are the perceptions of consultants regarding the various important factors that should be considered in hospital planning and designing works and ranking the most important factor/s among them?
- What are the existing Strength, Weaknesses, Opportunities, and Threats of the consultants involved in hospital planning and designing works?
- What are the existing qualifications of consultants involved in primary-level hospital planning and designing works?
- What are the various capacity enhancement-related activities for the consultant to enhance their existing capabilities for planning, and designing the primary level hospital?

1.3 Objectives of the study

- To find out the perception of consultants regarding the various important factors that should be considered in hospital planning and designing works and ranking the most important factor/s among them.
- To find out the existing Strength, Weaknesses, Opportunities, and Threats of the consultant involved in hospital planning and designing works.
- To assess the existing qualifications of consultants involved in primary level hospital planning and designing works.
- To find out the various capacity enhancement-related activities for the consultant to enhance their existing capabilities for planning, and designing of the primary level hospital.

1.4 Significance of the study

The research identifies the stated objectives in addressing the research questions which benefit the consultant involved in planning, and designing the hospital construction project. The technical capabilities of consultants and their organizational readiness are an utmost requirement for the sustainable planning, proper designing, and smooth implementation of the projects.

1.5 Scope and Limitations of Study

The scope of the study is to assess the organizational capacity, readiness, and capabilities of consultants involved in planning, and designing the hospital construction project. The scope also covers the assessment of capacity enhancement activities of them to find out the gaps in technical competencies and various training needs to fulfill the gaps in planning, designing, and implementation of the hospital construction projects at the local level.

II LITERATURE REVIEW

2.1 Health Building Projects in Nepal

Nepal is one of the South Asian countries lying between India and China with a population of 30.00 million approx. Administratively, the country is divided into 7 provinces, and 77 district coordination committees, and all together Nepal has 753 Rural municipalities/sub-metropolitan/metropolitan. Since, Nepali fiscal year 2020/2021 (2077/78), besides the project sanctioned and authorized to DUDBC, MoHP has selected and authorized the budget and programme to two hundred ninety-six local level for the implementation of the primary level hospital (category B) through the annual work plan and budget (AWPB), (MoHP, 2020).

2.2 Types of Hospital Buildings of Nepal

Health institutions are classified into five levels based on a minimum set of health services: community level (Health Posts or Community Health Units); Primary Hospitals; Secondary Hospitals; Tertiary Hospitals; Academic or Super-specialty hospitals.

Catchment population and geography are the basis for assigning the number of beds and identifying the required number of health workers. Standard drawings for each type of health institution are developed that facilitate the delivery of quality health services such as an attached bathroom in the delivery room, and Out Patient Department (OPD) room with privacy concerns of clients, while also mandating specifications for wiring, piping, and flooring that minimize infections and reduce cost-of-ownership. These standards will improve the quality of buildings built, reduce the times for completion of construction projects and promote the use of economical and locally available construction materials. (NHIDS, 2017).

Health service institutions are classified according to local, provincial, and federal governments. Classification is based on the type of health services tailored to the need of the population rather than the number of beds. Nepal Health Infrastructure Development Standards (NHIDS) have categorized the hospital building into four major categories as tertiary level hospital and federal academy of health sciences under the federal government; secondary level hospital and provincial academy of health sciences under the provincial government, and primary level hospital (A and B category), health posts (type A, B, C, and D), and ward-level health facilities (Type 1 and Type 2) under local level governments. NHIDS further categorized the Primary level hospital – category B into three different levels. B1- 15 bedded, B2- 10 bedded, and B3 – 5 bedded. This categorization implies health service delivery. Nepal Health Infrastructure Development Standards (NHIDS), 2017 and Integrated Health Infrastructure Development Programme (IHIDP) have laid out categorization, delineation, and investment plans for health infrastructure development, which are being implemented through all levels of government. Reconstruction work of various hospital buildings is currently ongoing in coordination with various national and international agencies (MoHP, 2017).

2.3 The local Level and its responsibilities function to implement health infrastructure

As per the local level act, municipality, rural municipality, sub-metro, and metro cities are the local level government. local level act, 2017 has delegated the authorities to the local level for the implementation of the health infrastructure project under their jurisdictions (local level act, paragraph 11). Under this paragraph, the local level is responsible to establish and operate the hospital under their jurisdictions. Whereas the level of hospital to be managed by the locals has been defined by the Nepal health infrastructure development standards (NHIDS, 2017).

2.4 Capacity Enhancement for health infrastructure implementation

Nepal faces major capacity constraints in its efforts to rehabilitate health infrastructure after the 2015 Gorkha earthquake, as well as the regular programmatic demands to upgrade and maintain health facilities across the country. Health infrastructure development planning and implementation will require building capacity across federal, provincial, and local government levels and the private sector to build a cadre of capacitated practitioners able to provide the technical service necessary to deliver facilities that are resilient to seismic and environmental hazards (MoHP/NHSSP,2017).

2.5 Guidelines for the Design and Construction of Health Care Facilities, Health Building Infrastructure Design, and Construction Guidelines(HBIDCG)

Nepal has initiated the design of health infrastructure in a planned way since 2006 A.D. Before that, often building infrastructures were built from individual ideas or as per the wish of the donor which in turn made the delivery of health services difficult and inefficient as the building infrastructure could not address the health service requirements. This led to the need to review the limits and capacity of every health care institution concerning population distribution, disease typology, geographic location, local demand, etc., and to set the standard design for them accordingly (NHIDS, 2017). The government could approve the setting up of any sub-health post only after the availability of required land or space was assured on the local level (Health Policy, 1991).

The standard guideline and associated type designs are prepared considering the available resources and minimum functional requirements of health services. This guideline will be subsequently revised and improvised concerning changes in health programs over time. The key objective of the guideline is to develop properly designed health infrastructures to enable healthcare institutions to deliver efficient health care services (HBIDGC, 2017).

2.5.1 Standard Design

A standard design refers to the type of design prepared with a balanced interrelationship between rooms of specified size and function required in a health care institution (HBIDCG, 2017). Such standard type designs consciously and with due consideration to the local context can save significant design costs and help to maintain uniformity of space and functional requirements as per the standard of health facilities.

In the course of implementation, the standard design must be critically reviewed so that the possible improvements can be made in the type designs as per the experience gained during the implementation process and as per local demands and complaints. The implementing agency should immediately inform the Management Division of the Department of Health Service (DoHS) about the shortcomings in type design if found any. Following points should be taken into account while using standard design: to construct as per standard design; to localize the type design as per local context; fitting to the comprehensive master plan; to get approval for the modification of standard designs; compliance with Nepal National Building Codes (NNBC) and working Drawings

2.6 Various International practices and review of relevant literature

CJ De Angelo, 2019 "The Guiding Principles of Hospital Design and Planning" has insisted that factors like the importance of infection control, staff efficiency, hospital workflow, as well as patient safety and comfort are often overlooked. He also urged that not every building can be turned into a hospital; a medical facility is a purpose-built structure. He suggested five key principles which are very crucial for hospital design and planning. The five principles are equipment-centric design; future possible expansion; interdepartmental flow; adequate review of design and caregiver-friendly design and planning.

To address some of these key guiding principles, a detailed design review methodology is required to comply with the international standards in hospital design in support of patient safety, infection control, and optimized workflows based on room and department placements and functional adjacencies. Medical facilities are some of the most technically complex building projects in the world and obtaining the right advice is key; and should be applied as early as possible to avoid costly mistakes and make the project a long-lasting success (Angelo, 2019).

MH Williams construction group, 2021 " Things to be considered when building medical facilities" suggested various factors that need to be considered while building a medical facility. The major factors are the size of the required space; use of proper materials; accessibility; security Features and environmental impact.

2.7 SWOT Analysis

SWOT analysis stands for Strength, Weakness, Opportunities, and Threats. It is a framework to evaluate the position of any firm/company to develop strategic planning. SWOT analysis assesses the internal and external factors (https://www.investopedia.com). A SWOT analysis is designed to facilitate a realistic, fact-based, data-driven look at the strengths and weaknesses of an organization, initiative, or within its industry.

2.8 Reliability

Cronbach's alpha is a statistic commonly quoted by authors to demonstrate that tests and scales that have been constructed or adapted for research projects are fit for purpose (Keith S. Taber, 2017).

Cronbach's alpha is a convenient test used to estimate the reliability, or internal consistency, of a composite score. Cronbach's alpha gives a simple measure to check the reliability of the score. Theoretically, Cronbach's alpha results should be numbers between 0 to 1, but sometimes, a negative value can also be found. The general rule of thumb is that a Cronbach's alpha of .70 and above is good, .80 and above is better, and .90 and above is best (https://www.statisticssolutions.com/cronbachs-alpha/).

2.9 Validity

It is the extent to judge how effective the research is. The validity can be computed by logical tests and statistical tests. The logical test is the justification of each question about the objective of the study whereas the statistical approach is calculating the coefficient of correlation between the questions and outcome variables (IMAX, 2018).

2.9.1 Test the validity of Pearson Correlation using SPSS

SPSS is the software developed by IBM. This is the most reliable and widely used software for statistical analysis in every sector all over the world. The validity test of Pearson correlation can be done in SPSS by following steps: (SPSS Test, n.d.)

2.10 Henry Garrett's Ranking Technique

This technique has been used to evaluate the ranks in the research. The orders of merit given by the respondents were converted into a rank by using the formula. To find out the most significant factor which influences the respondent, Garrett's ranking technique was used. As per this method, respondents have been asked to assign the rank for all factors and the outcomes of such ranking have been converted into score values with the help of the following formula: Percent position = 100 (Rij – 0.5) Nj, Where Rij = Rank given for the ith variable by jth respondents. Nj = Number of variables ranked by jth respondents. With the help of Garrett's Table, the percent position estimated is converted into scores. Then for each factor, the scores of each individual are added, and then the total value of scores and mean values of the score are calculated. The factors having the highest mean value are considered to be the most important factor (Dhanavandan, 2016).

III Methodology

3.1 Research Design

The methodological framework adopted in the course of the study is shown in figure 3.1. The first step of the research design is to identify the problem statement followed by formulating research questions, setting out the study objectives, and identification of the appropriate sets of tools for achieving the objectives. The Study Methodology has been adopted from Joshi and Bhattarai, 2021.

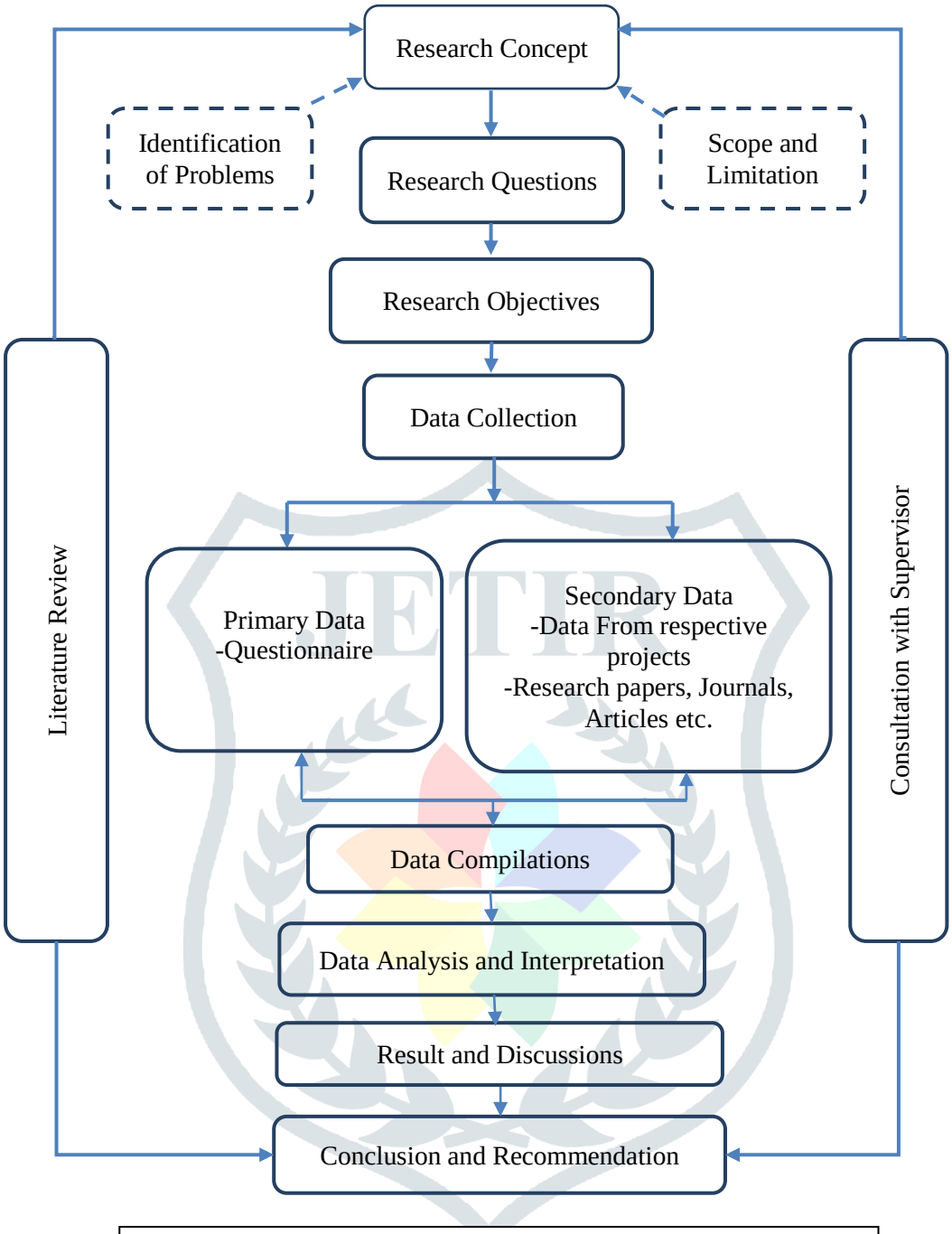

Figure 1: Study Methodology, (Adopted from Joshi and Bhattarai, 2021)

3.2 Research Approach

The approach that was used in this study is a qualitative research approach as the collected data were presented and analyzed with proportion. The study consists of both quantitative and qualitative approaches for an empirical study of consultants in planning and designing primary-level hospitals at the local level in Nepal.

3.3 Study Area

The study area covers the local level who are implementing or planning to implement the hospital building construction project across the Nepal in current Nepali fiscal year 2020/2021 (2077/78). All together three hundred ninety-six local levels were selected for the construction of a primary level hospital to whom the Ministry of health and population has authorized the budget through a multi-year procurement plan. Till the end of the fiscal year 2020/2021 (2077/78), MoHP has approved for One hundred and thirty-five local levels across the country.

3.4 Study Population

The study population shall comprise one hundred and thirty-five local levels to whom MoHP has given the approval of design within the fiscal year 2020/2021 (2077/78).

3.5 Sample Size

From those One hundred and thirty-five projects, the consultant (engineer/architect/designer) from each project, was considered. The sample size has been calculated using the formula as follows (Israel, 1992).

$n = \frac{z^2 pq/e^2}{1+(\frac{z^2 pq}{e^2 N})}$ where n = sample size, Z = Area of the normal curve and its value is 1.64 for 90% confidence level, e = Desired level of precision (Confidence interval), p = Estimated proportion of an attribute that is present in the population, and q are 1-p. Since the variability in the proportion is not known, therefore, maximum variability of 0.5 (i.e. p=q=0.5) is assumed.

3.5.1 Sample calculation

$n = \frac{1.64*1.64*0.5*0.5/0.1^2}{1+(\frac{1.64^2*0.5*0.5}{0.1^2*135})} = 45.12 = 46$ numbers

3.6 Methods of Data Collection

3.6.1 Primary Data:

The primary data were collected through a questionnaire survey with the consultant involved in the planning and designing of primary-level hospitals.

Key Informant Interview (KII): KII has been conducted with the expert to trace the factors related to the planning and designing of health facilities that are involved in the verification of the design submitted by the consultant for approval.

FGD: Focus group discussion (FGD) was conducted to trace out the existing strength, weaknesses, opportunities, and threats of the consultant working in the planning and designing of the primary hospital. The personnel working in the relevant field has been asked for the discussions.

3.6.2 Secondary Data*:*

Secondary information has been collected from the related literature which included published and unpublished journal articles, relevant reports, an academic thesis of national and international universities, and newspaper articles.

3.7 Data Analysis

Data were analyzed by the descriptive method. For the easier interpretation of data, they are expressed in percentages. Those percentages are implemented for expressing the findings as a proportion of the whole. For easy understanding, these findings are expressed in the form of charts and tables. To analyze the collected data and information from the questionnaire or interview Relative Importance Index method was used. This analysis was used for ranking the criteria concerning their relative importance.

Here, w = weight as assigned by each respondent on a scale of 1 to 5 where 1 implies the least and 5 implies the highest. A= highest weight and N is the total number of samples.

Akadiri (2011), stated that from RI values, we can transform five levels: High (H) (0.8 ≤RI≤1), High-medium(H-M) (0.6≤RI≤0.8), Medium (M) (0.4≤RI≤0.6), Medium-low(M-L) (0.2≤RI≤0.4) and Low (L) (0≤RI≤0.2). (Rooshdi, 2018)

3.8 Validity and Reliability of Data

3.8.1 Validity

It refers to the believability of the research. The construct validity index was computed to ensure the appropriateness of the research instrument. The construct validity index was computed using SPSS and is found to be valid.

3.8.2 Reliability

It refers to the consistency of the data. Reliability is an important condition for validity. It is possible to have reliable measures that are not valid. However, the valid measures must be reliable. The most common measure of internal consistency ("reliability") is Cronbach's equation. Researchers mostly use this equation to determine the reliability of the Likert scale used in survey questions/questionnaires. The formula for the standardized Cronbach's alpha is given by, $\alpha = \frac{N.\bar{c}}{\bar{v}+(N-1).\bar{c}}$, where, N is equal to the number of items, c-bar is the average inter-item covariance among the items and v-bar equals the average variance.

In this study, Cronbach's alpha was calculated by using SPSS and found to be greater than 0.7 which is more than acceptable. [Sim & Wright, 2005; Madan & Kensinger, 2017]. The Cronbach's Alpha for the questionnaire Section II- Factor affecting Hospital planning and design, Section III- Consultant's Capacity, and Section IV- Relevant Training are 0.711, 0.822, and 0.924 respectively. These values are greater than 0.7.

3.9 Research Matrix

Table 1: Research Matrix of the Study

S. N.	Objectives	Data Required	Data Collection Methods	Analysis	Results
1.	To find out the perception of consultants regarding the various important factors that should be considered in hospital planning and designing works and ranking the most important factor/s among them.	stakeholder's existing technical capabilities	Questionnaire Survey, Interview, Documents	RII	Readiness and capacities of stakeholders
2.	To find out the existing Strength, Weaknesses, Opportunities, and Threats of the consultant involved in hospital planning and designing works.	Existing gaps	Questionnaire Survey, Interview, Documents, FGDs	SWOT	Gaps
3.	To assess the existing qualifications of consultants involved in primary level hospital planning and designing works.	Existing qualifications	Questionnaire Survey, Interview, Documents	RII	Qualifications
4	To find out the various capacity enhancement-related activities for the consultant to enhance their existing capabilities for planning, designing, and implementation of the primary level hospital.	Capacity enhancement activities	Questionnaire Survey, Interview, Documents	RII and TNA	Training needs analysis

IV RESULTS AND DISCUSSION

4.1 Response Rate

The questionnaires were distributed to the consultant who has submitted the planning and designing of the primary level hospital. All together 105 consultants have been questionnaired among which 55 responses have been received.

Table 2: Questionnare Response Rate

S.N	Descriptions	Population	Required Sample Size	Targeted Responses	Actual Response	Percentage
	Consultant (Architect/Engineers/Designers)	**135**	**43**	**105**	**55**	

4.1.1 Gender wise, Age group distribution, and academic qualification of the Respondents:

Out of 55 respondents, 14 of them are female comprising 26% and the remaining 41 are male which comprises 74% of the total respondents. Similarly, the age group of the respondents is divided as: out of 55 respondents, 47% were below thirty, and nearly 50% of them are of the age group between thirty years to forty years old. On the other hand, regarding the academic qualification of the respondents, 43% of them have completed their bachelor's level qualification, and the remaining 58% have completed master's level education.

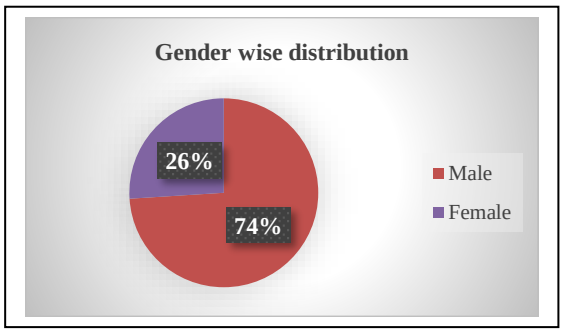

Figure: 2 Gender wise distribution

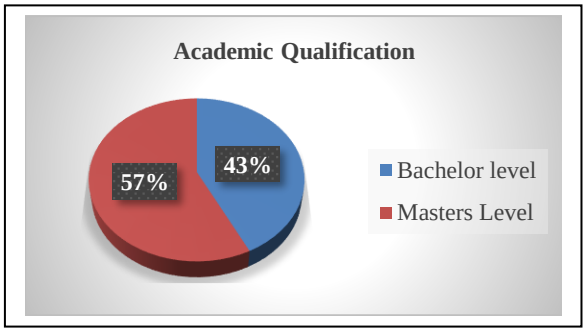

Figure: 3 Academic Qualification distribution

4.1.2 Experience of respondents and completed projects in the hospital planning and designing works:

The distribution of experience in the hospital planning and designing works of respondents is presented in figure below. Among 55 respondents, there were 22 respondents having experience below 5 years have completed 49 projects related to health facility planning and designing works. Similalry, 20 firms having six to ten years of experience have completed 45 projects and remaining 13 firms with experience of above 10 have completed 44 projects till date.

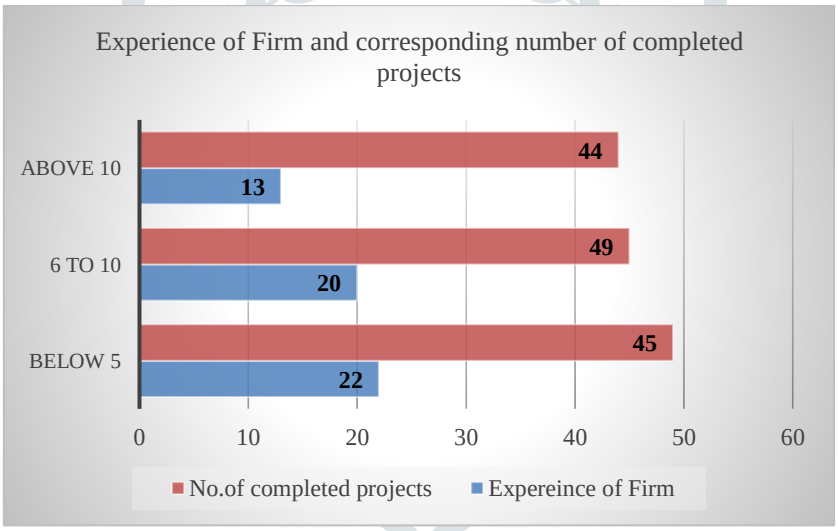

Figure 4: Experience of the Firm and completed projects

4.1.3 Acquired Specific Knowledge of respondents in hospital planning and designing related works:

Majority of the respondents more than 50 % of them have acquired the knowledge on hospital planning and designing works through Self practice and study of relevant literature. Whereas, 26 % of them have acquired the knowledge from academic curricular in the form of major and minor project works. Simialry, very few approximately 16% of them have acquired the knowledge through relvant short courses/ trainings on the hospital planning and designing related works. The details is depicted in figure below.

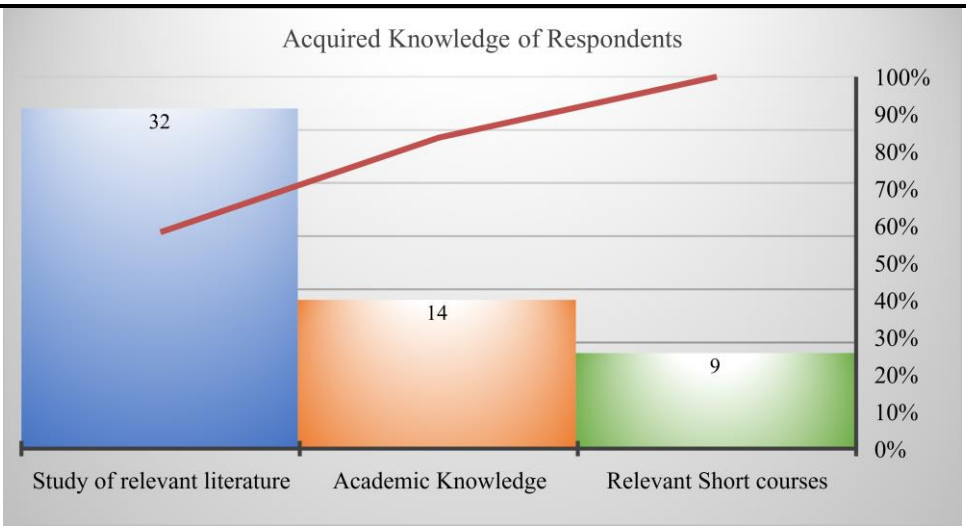

Figure 5: Acquired Knowledge of the Respondents on hospital planning and designing

4.2 Study Objective I: Perception of Consultants on Various Important Factors Required for Hospital Planning and Designing Works.

From the response of respondents obtained through a questionnaire survey, the frequency of the scores received by each variable based on the 5-point Likert scale was recorded.

The relative importance factors for each factor affecting KPIs have been assessed and ranked as per their value. RII = $\frac{\Sigma W}{A*N}$ ($0 \leq RII \leq 1$) , Where: W – is the weight given to each factor by the respondents and ranges from 1 to 5, (Where "1" is "Very Low Important" and "5" is "Very High Important");

A – is the highest weight (i.e. 5 on 5-point Likert's scale) and; N – is the total number of respondents. The value of RII has been qualitatively demonstrated as follows (Akadiri, 2011):

Table 3: RII values and their corresponding importance level

RII values	**Importance level**	
$0.8 \leq RII \leq 1$	High	H
$0.6 \leq RII \leq 0.8$	High-Medium	H-M
$0.4 \leq RII \leq 0.6$	Medium	M
$0.2 \leq RII \leq 0.4$	Medium-Low	M-L
$0 \leq RII \leq 0.2$	Low	L

Fourteen different important factors have been found from KII. These factors are equally important and should be considered while planning and designing primary-level hospitals. The respondents were asked to put the corresponding numerical value from 1 to 5 to depict the importance value of each factor. The responses are as follows:

Table 4: RII values and their corresponding importance level

F. N	**Factors**	**Frequency of the score (x)**					**Total**	**RII**	**Importance Level**
		5	**4**	**3**	**2**	**1**	**Σf**		
1	Orientation of land	28	23	0	4	0	55	0.873	H
2	Knowledge of hospital planning and design guidelines and standards	43	12	0	0	0	55	0.956	H
3	Mandatory Site Visit	41	10	2	2	0	55	0.927	H
4	Contextualization and localization of the standard design and guidelines	32	23	0	0	0	55	0.916	H
5	Linkages between different department (Emergency, OPD, diagnostics, etc.)	47	6	2	0	0	55	0.964	H
6	Fulfillment of client's requirement is important than complying with standards	8	16	6	17	7	54	0.604	M

7	Provision of support services like mortuary block, staff quarter, ambulance parking, an adequate waiting area for visitors	23	30	1	0	0	54	0.881	H
8	Choice of construction technology and selection of the proper construction materials	20	32	0	2	0	54	0.859	H
9	Provision of functional part of the hospital like proper lighting, ventilation, indoor air quality, waste management and infection control etc,	33	20	1	0	0	54	0.919	H
10	Optimization of the existing infrastructure while upgrading to higher level	14	40	0	0	0	54	0.852	H
11	Need assessment is mandatory	21	32	0	1	0	54	0.870	H
12	Provision of universal accessibility like disabled friendly, child friendly, gender friendly	36	17	1	0	0	54	0.930	H
13	Should be resilient to the multi hazards (like earthquake, flood, landslides, fire etc.,)	42	11	1	0	0	54	0.952	H
14	All major components of hospital building like structural component , non structural component and functional component are equally important	32	21	0	1	0	54	0.911	H

As per RII, it was found that almost all respondents think that every factor is a highly important factor that needs to be considered while planning and designing the primary hospital. **Out of fourteen factors**, only **one factor relat**ed to fulfillment of ***client's requirement than complying with standards*** is of medium importance. Among, thirteen highly important factors, the top five highly important factors as per the RII values are:

a. Linkages between different departments (Emergency, OPD, diagnostics, etc.) with the RII value of 0.964.
b. Knowledge of hospital planning and designing related guidelines and standards with an RII value of 0.956
c. Resilient to the multi-hazards (like an earthquake, flood, landslides, fire, etc.,) with an RII value of 0.942
d. Mandatory Site Visit with RII value of 0.927
e. Provision of universal accessibility like disabled-friendly, child-friendly, and gender-friendly with an RII value of 0.920

4.2.1 RANKING THE MOST IMPORTANT FACTOR/S THAT ARE REQUIRED IN HOSPITAL PLANNING AND DESIGNING WORKS.

Under the analysis of important factors which should be considered during the hospital planning and designing works, respondents were asked to rank the fourteen important factors.

Fourteen different important factors have been assessed using the Garrett Ranking Method. The perspective of the respondents towards the ranking of most important factors in hospital planning and designing works has been assessed and presented.

Table 5: Preference and Ranking gave by the respondents

S.N.	Factor Number	Rank given by Respondents													
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th
1	F1	28	23	0	4	0	0	0	0	0	0	0	0	0	0
2	F2	43	12	0	0	0	0	0	0	0	0	0	0	0	0
3	F3	41	10	2	2	0	0	0	0	0	0	0	0	0	0
4	F4	32	23	0	0	0	0	0	0	0	0	0	0	0	0
5	F5	47	6	2	0	0	0	0	0	0	0	0	0	0	0
6	F6	8	16	6	17	8	0	0	0	0	0	0	0	0	0
7	F7	23	30	1	1	0	0	0	0	0	0	0	0	0	0
8	F8	20	32	0	3	0	0	0	0	0	0	0	0	0	0
9	F9	33	20	1	1	0	0	0	0	0	0	0	0	0	0
10	F10	14	40	0	1	0	0	0	0	0	0	0	0	0	0
11	F11	21	32	1	1	0	0	0	0	0	0	0	0	0	0
12	F12	36	17	1	1	0	0	0	0	0	0	0	0	0	0
13	F13	42	11	1	1	0	0	0	0	0	0	0	0	0	0
14	F14	32	21	1	1	0	0	0	0	0	0	0	0	0	0

The percentage position of all factors has been determined by using the following formula and presented in **Error! Reference source not found.**. Percent position = 100 (Rij – 0.5) / Nj, Where, Rij = 1^{st}, 2^{nd}, 3^{rd}, 4^{th}, 5^{th}, 6^{th}, 7^{th}, 8^{th}, 9^{th}, 10^{th}, 11^{th}, 12^{th}, 13^{th}, and 14^{th} rank and Nj = Total rank given by 55 respondents = 14

Table 6: Percent Position of Factors

Rank	Percent Position= 100(Rij-0.5)/Nj	Rank	Percent Position = 100(Rij-0.5)/Nj
1	3.57	8	53.57
2	10.71	9	60.71
3	17.85	10	67.85
4	25.00	11	75.00
5	32.15	12	82.14
6	39.28	13	89.28
7	46.42	14	96.42

After determining the percent position of each rank, the Garrett value for the corresponding percent position has been determined from the Garrett ranking conversion table and presented in **Error! Reference source not found.** below.

Table 7: Percent Position And Garret Value

Rank	Percent Position	Score (Garrett Value)	Rank	Percent Position	Score (Garrett Value)
1	3.57	84.69	8	53.57	48.25
2	10.71	74.44	9	60.71	44.76
3	17.85	68.59	10	67.85	40.82
4	25.00	63.44	11	75.00	37.70
5	32.15	60.16	12	82.14	31.88
6	39.28	55.05	13	89.28	25.74
7	46.42	51.85	14	96.42	16.00

Each rank response has been multiplied by the corresponding Garrett score to find the total Garett Score and its average score. The value has been tabulated in the table below.

Table 8: Calculation of Garret Value and Ranking

Factor Number	Rank given by Respondents														Total	Avg	Rank
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th			
F1	2371	1712	0	253.8	0	0	0	0	0	0	0	0	0	0	4337.20	78.86	9
F2	3642	893.3	0	0	0	0	0	0	0	0	0	0	0	0	4534.95	82.45	2
F3	3472	744.4	137	126.9	0	0	0	0	0	0	0	0	0	0	4480.75	81.47	4
F4	2710	1712	0	0	0	0	0	0	0	0	0	0	0	0	4422.20	80.40	6
F5	3980	446.6	137	0	0	0	0	0	0	0	0	0	0	0	4564.25	82.99	1
F6	677.5	1191	412	1078	481	0	0	0	0	0	0	0	0	0	3839.86	69.82	14
F7	1948	2233	68.6	63.44	0	0	0	0	0	0	0	0	0	0	4313.10	78.42	10
F8	1694	2382	0	190.	0	0	0	0	0	0	0	0	0	0	4266.2	77.5	12

				3											0	7	
F9	2795	1489	68.6	63.44	0	0	0	0	0	0	0	0	0	0	4415.60	80.28	7
F10	1186	2978	0	63.44	0	0	0	0	0	0	0	0	0	0	4226.70	76.85	13
F11	1778	2382	68.6	63.44	0	0	0	0	0	0	0	0	0	0	4292.60	78.05	11
F12	3049	1265	68.6	63.44	0	0	0	0	0	0	0	0	0	0	4446.35	80.84	5
F13	3557	818.8	68.6	63.44	0	0	0	0	0	0	0	0	0	0	4507.85	81.96	3
F14	2710	1563	68.6	63.44	0	0	0	0	0	0	0	0	0	0	4405.35	80.10	8

The consultant working in primary hospital planning and designing works ranked the F5 i.e. *Linkages between different departments (Emergency, OPD, diagnostics, etc.)* is the most important factor that should be considered during the planning and design works with the average percentage of 82.99. Similarly, the consultant also agreed upon the factor F2, *i.e Knowledge of hospital planning and design guidelines and standards* is equally required for primary level hospital planning and designing works with the average percentage of 82.45 as 2nd ranked most important factor. The third most important factor that the consultant agreed on is factor F13, *i.e Multi-hazard resilient design* with an average percentage of 81.96. The details of ranks have been depicted in the figure below.

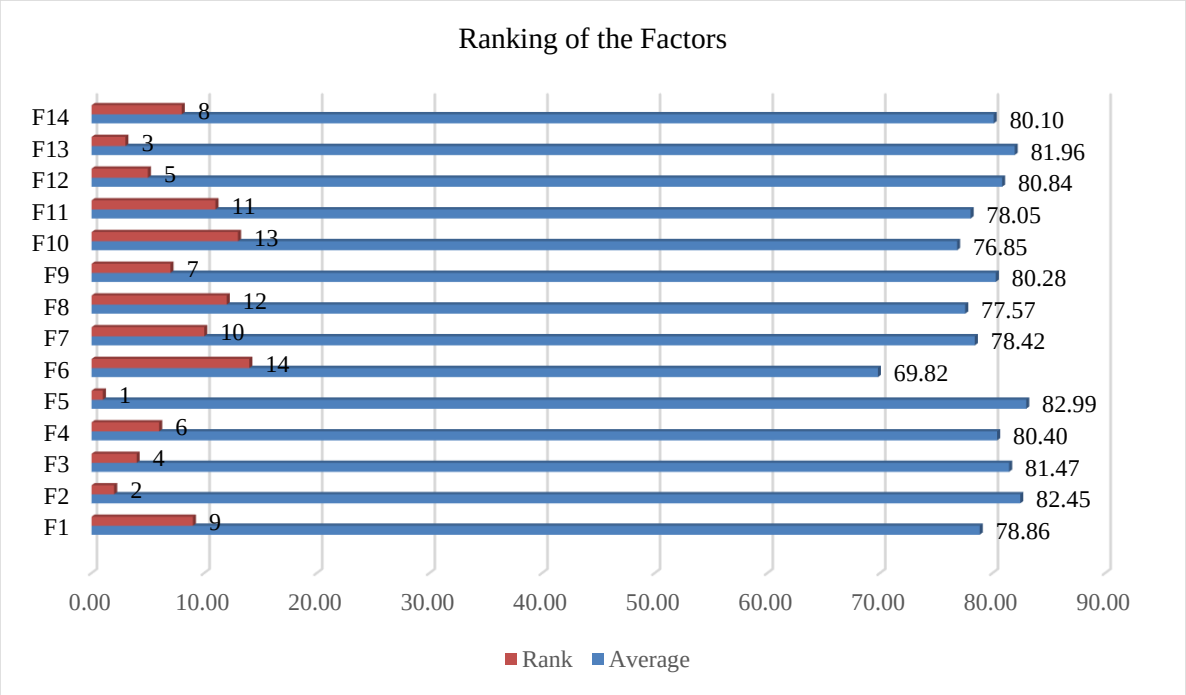

Figure 6: Ranking of the Factors

4.3 Study Objective II: Strength, Weakness, Opportunities, and Threats (SWOT) Analysis

The second objective of the study was to conduct a SWOT analysis of the consultant who is involved in hospital design works. The questionnaire survey was carried out to find out the existing strength, weaknesses, opportunities, and threats of the consultant. FGD was also done with an experienced consultant who has been involved in the planning and designing of the health facilities-related works to cross-verify the SWOT. The output of the SWOT analysis has been presented here below.

Figure 7: SWOT Analysis in the study

4.3 Study Objective III: The Existing Qualifications of Consultants Involved in Primary Level Hosptial Study Planning and Designing Works

The criteria to measure the existing qualifications of consultants have been taken from the PPR (Public Procurement Regulations, 2007 -with recent amendments)- criteria for evaluating the technical proposals for the procurement of services. The value has been presented and depicted in the figure below.

Existing Qualifications of Consultants regarding the planning of designing of primary hospital following observations have been made:

- The majority of consultants think and agreed to the extent that they have the required qualification to plan and design the primary level hospital projects.
- The respondents agree that their mean score for each criterion is greater than 2, which shows they are competent in each criterion on an average.
- Among seven different qualification criteria, the majority of the respondents agreed to a greater extent than they can accomplish work with a mean value of 2.56 and a Standard Deviation of 0.56.
- Among seven different qualification criteria, the majority of the respondents agreed to a greater extent that they have a lesser amount of Specific Experience in Hospital Planning and Design experience financial stability with a mean value of 2.09 each and a Standard Deviation value of 0.61 and 0.55 respectively.

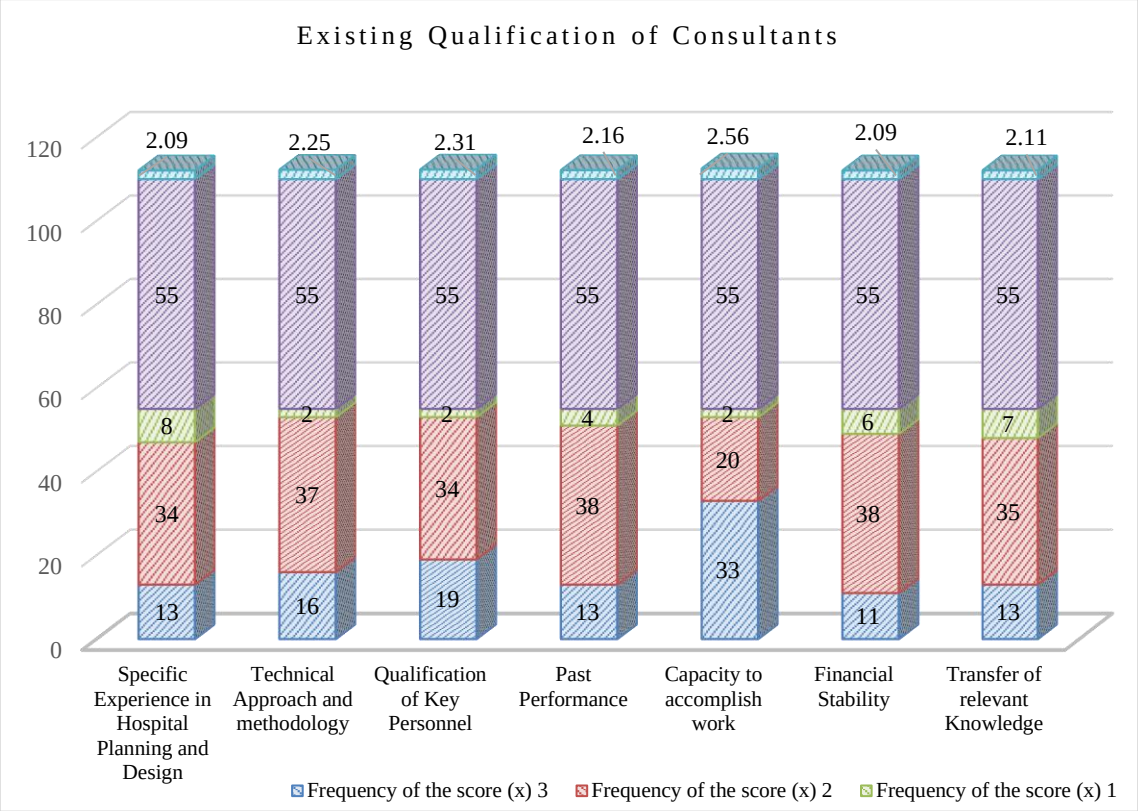

Figure 8: Existing Qualification of Consultants

4.4 Study Objective IV: Assessment of The Capacity Enhancement Related Activities for the Consultant

The effort was done to list out the important training which is required for the consultant to enhance their existing capacity for planning and designing the primary level hospitals at the local level. The respondents were asked to score the values for eight different trainings with their importance in primary level hospital planning and designing works using a 3-point Likert's scale with corresponding values as 3- Highly important, 2-Moderate important, and 1- Low important. The list of training was identified and determined from the RII. The responses are depicted in the figure below.

- The majority of respondents agreed that all probable training is important based on the RII value and their corresponding importance level as each training has a value greater than 2.
- The majority of respondents agreed that the top three ranked lists of training are training on relevant standards and guidelines, training on multi-hazard resilient health infrastructure, and training on conceptual and detailed architectural planning with ranks 1, 2, and 3 and RII value 0.556, 0.545 and 0.516 respectively.
- The majority of respondents thought and agreed all listed training is important to enhance the existing capacity of the consultants for planning and designing the primary-level hospital projects with an average score greater than 2.
- Among eight different lists of training, the majority of the respondents agreed to a greater extent than 'Training on Relevant Standards and guidelines' is relatively the most important training with a mean value of 2.78 and a Standard Deviation of 0.49.
- Among eight different lists of training, the majority of the respondents agreed to a greater extent than ' Training on Waste management area design is relatively lesser important training with a mean value of 2.47 and Standard Deviation of 0.63

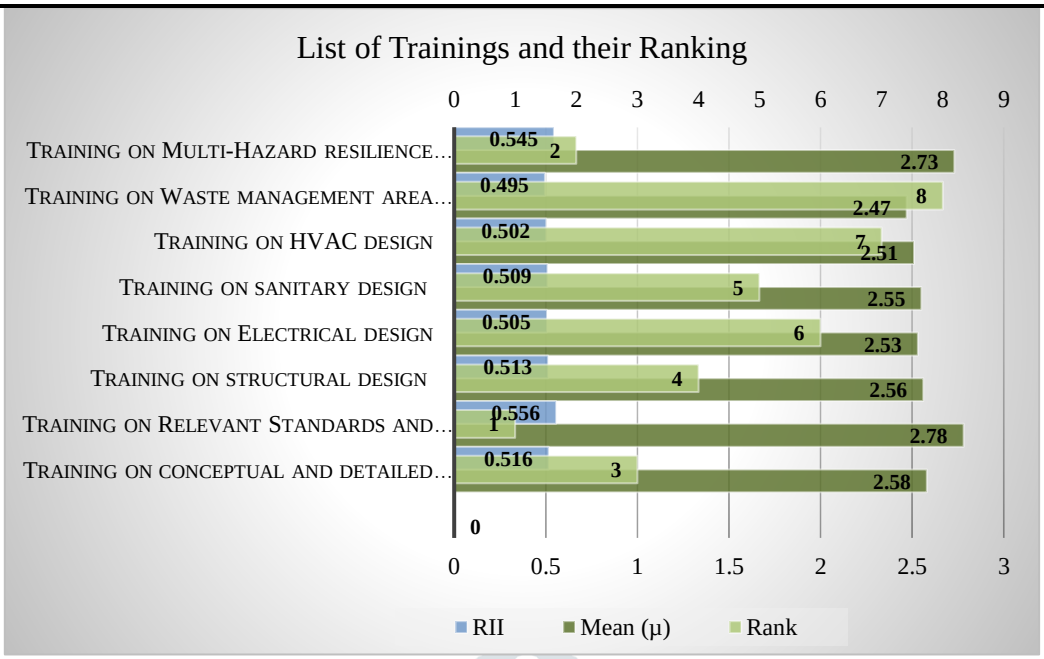

Figure 9: List of Training and their Ranking

V. Conclusions

The majority of the respondents (more than 50 %) of them have acquired knowledge of hospital planning and designing works through Self-practice and study of relevant literature. Whereas, 26 % of them have acquired knowledge from academic curricula in the form of major and minor project works. Similarly, very few approximately 16% of them have acquired the knowledge through relevant short courses/training on the hospital planning and designing related works.

All fourteen factors are equally important factors that need to be considered during the planning and designing of the primary hospital. Out of which, one factor related to fulfillment of client's requirement than complying with standards is of medium importance. Among fourteen factors top-five ranked important factors to be considered while planning and designing a primary hospital are linkages between different departments (Emergency, OPD, diagnostics, etc.), complying with related guidelines and standards, and design should be resilient to the multi-hazards, mandatory site visit, and the hospital should be able to cater universal accessible for disabling, child and gender friendly.

The SWOT analysis showed that the consultant's strengths are the general experience in the firm in the related field, an effective network of professionals, competent Human Resources, a strong team, and general knowledge of standards and guidelines about the hospital planning and designing work as their strength. However, there is some weakness as inadequate projects and demand for high remuneration by the experts, lack of in-house experts like electrical, sanitary, HVAC, lack of training related to health services design, availability of limited case studies, and lack of easy availability of the specified material used in the market.

Similarly, consultant thinks there are opportunities like working with multiple stakeholders, areas, and scope of improvement in current codes & practices for Health infrastructure, stakeholder's input and concerns induced the generation of innovative ideas and concept, HF interventions are still a big requirement for Health sector reforms, stable government, and federalization, time available to review the design, drawings, prompt and positive support from stakeholders. On the other hand, there are some threats like frequent changes of officials at the local level, delays in procedures resulting in confusion and additional work, social, economical, and political influences in the external environment, lack of supportive role from the local level government, local levels governments are not fully aware of standard design and compliance requirements

The majority of consultants involved in planning and designing primary-level hospitals have the required qualifications. Among seven different qualification criteria, the majority of the consultant agreed that they can accomplish work whereas, whereas they insisted that they have a lesser amount of specific experience in hospital planning and design and financial stability.

The majority of consultants thought and agreed that all listed training is equally important to enhance the existing capacity of the consultants for planning and designing the primary level hospital projects. The top three ranked lists of training are training on relevant standards and guidelines, training on multi-hazard resilient health infrastructure, and training on conceptual and detailed architectural planning with ranks 1, 2, and 3 respectively.

VI. Recommendations

1. The study recommends that all fourteen factors which are required for proper planning and designing of the primary hospital need to be incorporated with high importance while planning and designing the primary level hospital. It stressed that consultants should have sound knowledge of linkages between different departments (Emergency, OPD, diagnostics, etc.), should comply with related guidelines and standards, and should be designed resilient to the multi-hazards (like an earthquake, floods, landslides, fires, etc.,), should visit site mandatorily and should comply with design for universal accessibility (disable, child, and gender-friendly).

2. The study recommends that the strength and opportunities factor of the consultant involved in planning and designing the primary level hospital needs to be enhanced as far as possible by decreasing the weakness and threats factors to the maximum possible extent.
3. As the consultant has adequate capacity to accomplish the work, however, it is recommended that consultant should enhance their specific work experience in planning and designing primary level hospitals and should improve the financial stability.
4. To enhance the existing capacity of the consultants involved in planning and designing the primary hospital, it is recommended that all relevant training should be given by the concerned authority primarily MoHP.
5. It is recommended that most important training like training on relevant standards and guidelines, training on multi-hazard resilient health infrastructure, and training on conceptual and detailed architectural planning are relatively important to enhance the capacity of the consultants which also comprises the enhancement of the opportunities associated with the external factors of SWOT analysis.
6. On the other hand, it is also recommended that the weakness associated with the external factors of SWOT analysis needs to be reduced by conducting the orientation and awareness programme at the local level regarding existing guidelines and standards on health infrastructure development and construction by concerned authority primarily by MoHP.

6.1 Recommendation for Further Study

This study has explored the knowledge related to the empirical study of consultants involved in planning and designing primary hospital planning in Nepal. There are lots of areas for further study and research.

- Study related to the implementation status of the primary level hospital at the local level.
- A case study related to compliance checks with the standards and actual construction of primary level hospitals at the local level.
- Study-related to universal accessibility in the hospital.
- Study-related to the capacity of local level to implement the primary level hospital

REFERENCES

[1] Akadiri, P. (2011). Development of a Multi-Criteria Approach for the Selection of Sustainable Materials for Building Projects.

[2] Application of Garret Ranking Technique: Practical Approach Dr. Dhanavandan S. International Journal of Library and Information Studies. Vol. 6(3) Jul-Sep, 2016 www.ijlis.org ISSN: 2231-4911

[3] Government of Nepal, *Public Procurement Act 2006*

[4] Government of Nepal, *Public Procurement Rule 2007*.

[5] Government of Nepal, *Local Level Act*, 2017

[6] Guiding principles for hospital design and planning, CJ De Angelo, Senior Hospital Technology Planner, GE Healthcare Africa & South East Asia | Dec 18, 2019. https://insights.omnia-health.com/hospital-management/guiding-principles-hospital-design-and-planning [Accessed June 2021].

[7] Israel, G.D. (1992) Determining Sample Size. University of Florida Cooperative Extension Service, Institute of Food and Agriculture Sciences, EDIS, Florida.

[8] Joshi, G. K., & Bhattarai, S. K. (2021). A Comparative Study Of Supply Chain Management In Building Construction Projects Within Kathmandu Valley.

[9] Keith S. Taber, 2017, Res Sci Educ (2018) 48:1273–1296 DOI 10.1007/s11165-016-9602-2. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education

[10] Ministry of Health and Population (MOHP*), Annual Work Plan and Budget (AWPB),*2020/2021

[11] Ministry of Health and Population (MOHP*), Joint Annual Review (JAR) Report for Progress of Health Sector*, 2018

[12] Ministry of Health and Population (MOHP*), Nepal Health Infrastructure Development Standards (NHIDS)*, 2017

[13] Ministry of Health and Population (MOHP*), Health Building Infrastructure Design and Construction Guidelines (HBIDCG)*, 2017

[14] Ministry of Health and Population (MOHP*), Health Policy*, 1991

[15] Nepal Health Sector Support Programme (NHSSP), 2017. A Final Report on Health Infrastructure Capacity Enhancement Programme Outline Design Report. Kathmandu.

[16] Nepal Health Sector Support programme (NHSSP), 2017. Report: Training Needs Analysis for Ministry of Health and Department of Urban Development & Building Construction Staff Kathmandu:

[17] SPSS Test, n.d. www.spsstests.com. [Online] Available at: https://www.spsstests.com/2015/02/how-to-test-validity-questionnaire.html [Accessed May 2020].

[18] Things to Consider When Building Medical Facilities, MH Williams Construction Group. https://www.mhwilliams.com/things-to-consider-when-building-medical-facilities/. [Accessed June 2021].