MEASURES TO PROMOTE LOCAL PARTICIPATION FOR SOURCING OF SKILLED MANPOWER IN SMALL HYDRO PROWER PROJECTS IN UTTRAKHAND

By

NEETIKA SHARMA MEHTA

SCHOOL OF BUSINESS MANAGEMENT

Submitted

IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE DEGREE OF DOCTOR OF PHILOSOPHY

TO

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

DEHRADUN

MAY, 2018

Under the guidance of

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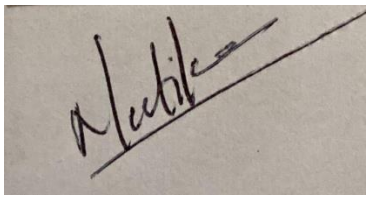
Declaration

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.



Signature

Neetika Sharma Mehta Date: 04/06/2020

Place: Dehradun

“I would like to dedicated this thesis to my family”

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THESIS COMPLETION CERTIFICATE

This is to certify that the thesis on "**Measures to promote local participation for sourcing of skilled manpower in Small Hydro Power Projects in Uttarakhand**" by **Neetika Sharma Mehta** in Partial completion of the requirements for the award of the Degree of Doctor of Philosophy (Management) is an original work carried out by her under our joint supervision and guidance.

It is certified that the work has not been submitted anywhere else for the award of any other diploma or degree of this or any other University.

Dr. Atul Razdan
Internal Guide

Date: 06/04/2020
Place: Dehradun

Dr. R Jayaraj
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Date:06/04/2020
Place: Dehradun

Alliance for an
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CERTIFICATE

I certify that Ms. Neetika Mehta has prepared her thesis entitled ' 'Measures to promote local participation for sourcing of skilled manpower in Small Hydro Power Projects in Uttarakhand", for the award of Ph.D Degree of the University of Petroleum & Energy Studies, under my guidance. She has carried out the work at the Department of General Management,University of Petroleum & Energy Studies, Dehra Dun.

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ABSTRACT

Renewable energy sources have significant potential to commit towards the sustainability of the energy both economically and socially. Hydropower is one of the most valuable renewable energy resource present on our planet and the only renewable energy for several countries that has the potential to dilate ingress to electricity to massive populations. India holds fifth position globally in terms of rich potential from hydro power sources but is majorly lacking in meeting its potential ability. One of the significant reason that may be attributed to this phenomenon is shortage of manpower for the small hydro power projects in India. The problem of manpower shortage is not only because of lack of skills, in addition there are a number of contributing factors for shortage of manpower in the small hydro power industry.The aim of the study is to identify activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttarakhand and find out types and measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttarakhand. The study considered mixed methods sequential explanatory design to observe the list of skill gap and analyze measures to fill the skill gap present during the construction phase of the small hydro power plant. Based on the conceptual analysis, a conceptual framework was constructed for generating a basic understanding of the constructs and their relationship in the study. The finding from the study suggests that division of opportunities for employment must be given to the local area people. Where, measures for most of the employment opportunity for less educated local folks could be observed in the area of unskilled or temporary labor. The recommendations of the study has been strategically categorized under heads such as, the young folks who are well educated may be employed in the office as skilled employees after providing them with some basic training on the skills expected from them to display. Another way to help them may be by providing them self employment generating skills. The locals may also work as contractors as this will give boost to their business and also give the hydro power company a local connect for the procurement of different items. The organization may also indulge in formation of women's self help group's along with providing them some basic training.

The findings of the study may also be applicable to other organizations/sectors considering measures towards various considerations for partnering of primary stakeholder with non-stakeholder in a mutual benefit scenario. The study observes that a successful partnership, establishing alliance at every step of partnership can be the contributing factor towards the empowerment of involved stakeholders for social and economic change.

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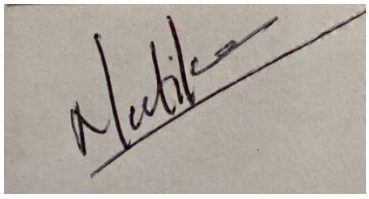
This thesis is dedicated to my husband Lt. Col Avijit Mehta and my beloved sons master Akshaj Mehta and master Atharv Mehta who have always stood by me and dealt with all of my absence from many family occasions with a smile. Their support and care helped me overcome setbacks and stay focused on my research study. Together, they have been a propelling force throughout this study.



Neetika Sharma Mehta

May 2018

Dehradun

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OUTLINE OF THE THESIS

The aim of this thesis is to address the management concerns in the sector of hydro power energy in India. The thesis elaborates on the present status and possible future of Indian hydro power sector which narrows down to reviewing in-depth actual v/s potential analysis of the 'Small Hydro Power industry' in India. Inquiring further deeper in the small hydro power industry the study indicated towards the alarming position of the actual position v/s the potential achieved within the state of Uttrakhand. Thus the study followed a strategic outline to interrogate the various reasons aforementioned in various government reports, news reports, and statements by the industry itself which would be possible significant barriers to acting as hindrance in achievement of long-term sustainability of small hydro power sector. Hence, barriers and challenges with the aspect of management towards achievement of sustainable future were finally exposed. The study finds that the aspiration of mobilizing of small hydro power in the region up to its potential is because of the scarcity of skilled manpower being certain specialist roles, as one of the major reasons for the delay in achieving the maximum results.

Therefore, the thesis has been divided into chapters, with each chapter describing as follows:

Chapter 1- Gives an introduction about the basic understanding of the researcher on the management aspects of hydro power industry and how "Inadequate availability of skilled manpower at the execution stage is leading to cost overrun in Indian small hydro sector".

Chapter 2 - Chapter on literature review would give a basic and brief overview of various literatures available of other researchers available on the topic of study. Following the literature review, significant gaps have been noticed and furthermore the process of gap identification and its alignment is explained via tabular illustration. Subsequently, brief overview on Theories and Models of strategic ways to source manpower, Constructs of sourcing manpower in small hydro business scenario of India has been narrated in this Chapter.

Chapter 3 - This chapter has outlined the theoretical framework for the study, pragmatism, and discussed, why it is particularly suited to this study. The chapter also discussed the importance of mixed methods sequential explanatory design and how it best suits the current study under consideration.

Chapter 4 - In this chapter, the study observed the list of skill gap present during the construction phase of the small hydro power plant and discusses the first objective of the study. The correlation matrix, reliability, validity & internal consistency, total variance and rotated component matrix along with recommendations and discussion has been described in detail.

Chapter 5 - This chapter discussed the case study analysis elaborately. Two cases were selected for observing the various measures and scope of social inclusion during construction stage of a small hydro power plant in Uttrakhand. After the data was collected and compiled, the study then moved to its next step of coding the data for in-depth analysis. Furthermore, Cross-Case Analysis has been described and discussed. Similarities and dissimilarities between the two case studies have been discussed in detail. Inferences were drawn from the cross case comparisons and these inferences were converted into propositions.

Chapter 6 & 7 – This chapter describes the researchers view, recommendations and a conclusion to the thesis. This study addresses some of the key human resource challenges in the small hydro power sector today. From a stakeholder's development perspective, it is important to determine the effectiveness of partnership and the contribution towards the empowerment of involved stakeholders for social and economic change.

CHAPTER 1 - INTRODUCTION

*"Purveying 16 percent global electricity all over the world, hydropower is a paramount power supply."(*Energy, *BP Statistical Review of World)*

1.0 SIGNIFICANCE OF RENEWABLE ENERGY SOURCES GLOBALLY

Renewable energy sources (RES) have significant potential to commit towards the sustainability of the energy both economically and socially as the worlds present scenario. These would aid in improvement access of energy so that most population may be benefitted, they also reduce emissions of local and global pollutants and they may create local socioeconomic development opportunities. With much advancement on the technological front with respect to mass communication, public have been growing towards being aware about the disadvantages if fossil fuels are spent. As per the recent times, renewable energy is ut-most valued. People have been compelled towards noting serious account about the renewable energies as they are clean and sustainable in nature. Much research is being done at this domain by scientists and engineers from all over the world. New ways and techniques for using these sources of energy are constantly being researched.

Renewable energy produces only small portions in emission of the carbon gases and hence, aids in battling the problems of climate change which is constantly being caused by burning of fossil fuels. With generation of power through renewable energy, bringing price stability in the economy is quite possible. This is possible due to the fact that only initial cost is no doubt extremely high, but in long term they pay in terms quite well. Moreover, they are not affected by the fluctuation prices of coal, gas and oil. Many sources of renewable energy have been in usegage these days such as wing energy, solar, hydro , biomass etc.

The key target is, incorporation of Hydro power as renewable energy resources to reach the apogee where there will be no other resources harming the environment in use. Considering the numerous pros of the Hydro power as renewable energy sources inclusive of the affordable cost

of power system, the viability and it's rectification, many countries are favoring and aiming at the installation and bringing of such energy source into use that will in return elevate their economy and help in the moderation of climatic change. The subject concern can only be solved if implemented by maximum population including the rural areas, and that is impossible without education. The most significant factor of awareness is education, which will help in spreading the consciousness among the people regarding benefits of using the hydropower as renewable energy sources which contribute a good deal in the well being of the living beings and the environment

1.1 HYDRO POWER POTENTIAL - WORLDWIDE

In recent times, suddenly the world has witnessed an upsurge in the development of hydro power. In the time period from 2005 to 2015 the capacity installed has grown up by approximately 39%. It has developed with almost 4% per year growth rate. Rise has been fixed in growing economies as these are a sustaining and clean source of energy and also provide facilities like clean water, security for water, and act as facilitator for the growth of remote areas at the regional and economical front. As one aspect , significant growth can we observed in terms of economy and sustaining practices in the industrywith acceptance by non stakeholders like NGO and local communities. And the other aspect, some stakeholders still criticize the development of the hydro power projects based on their prior experiences which have left a negative impact and lack in bringing out the positives of these projects.

Table 1.1 shows the nations with the largest hydropower capacities in the world. As per the records of 2015, capacity of hydro power in India has accounted for nearly 6% of installed capacity globally, but few countries are much ahead when compared with India. Such as Unites states of America with 8.4% capacity, Brazil is with 7.6% capacity and china with 9.5% capacity. Though India’s position is fifth in the world, but still there is huge potential for the country to advance and it may be able to achieve by almost three times the capacity achieved at present.

	Total Capacity end of 2015 (GW)	Added Capacity in 2015 (GW)	Production (TWh)
China	318	18	1,125
USA	102	0.1	250
Brazil	92	2.5	382
Canada	79	0.7	376
India	52	1.9	120
Russia	51	0.2	160

TABLE 1.1: TOP HYDROPOWER CAPACITY AS OF 2015, BY COUNTRY (Source: (World Energy Resources Hydropower, 2016)

Approximately as per global scenario, 10,000TWH per year is the unutilized ability of hydro power sector. Hence, various techniques and methods are opening up for creating optimum usage of hydro power across the world. Ultimately as per the conditions of the market, policies laid down by the government and development of other competing sources, the generation of hydro power will be subjective.

1.2HYDRO POWER POTENTIAL – INDIA

India holds fifth position globally in terms of rich potential from hydro power sources. The hydro power potential can be exploited from the six major river basins or even referred as systems in the country. About 80% of the total potential can be accounted from Ganga, Indua and Brahmaputra alone, despite the governance on utilization of Indus which is under the scheme of Indus water treaty with Pakistan. The economic potential has been of about 1, 50,000MW out of which only

60% load factor of 84,044MW has been exploitable from these rivers. In table 12, Status of growth of the hydro power according the regions have been illustrated below. Also only 5,000MW pumped storage capacity is useable as against identified capacity of 94,000 MW. The assessment of small hydro (up to 25 MW) potential has indicated nearly 10,000 MW distributed over 4,000 sites. Almost 5,000 MW is considered to be estimated as an unidentified small hydro potential.

Basin	Potential (MW)	Potential Developed (MW)	Potential under Development (MW)	Balance Potential (MW)	Balance Potential (%)
Indus Basin	19,988	3,731	1,156	14,701	73.55
Ganga Basin	10,715	1,901	1,367	7,447	69.5
Central Indian Rivers	2,740	1,060	1,147	533	19.45
West Flowing Rivers	6,149	3,704	41	2,404	39.09
East Flowing Rivers	9,532	4,168	144	5,220	54.76
Brahmaputra Basin	34,920	661	1,085	33,175	95
Total	84,044	15,225	5,339	63,480	75.53

Table 1.2: Potential of hydro power as of 1 January 2015(Source: (Ramanathan & Abeygunawardena, 2015)

The growth of hydro power sector is significantly slow in every aspect, which is raising alarms among the planners of the power sector and growing general concern all over. Especially when this sector has innumerous advantageous points when compared to the other sources of renewable energy.

1.3 HYDRO POWER POTENTIAL – INDIA (STATE-WISE)

Hydropower is a one of the most valuable renewable energy resource present on our planet and the only renewable energy for several countries that has the potential to dilate ingress to electricity to massive populations, in spite of that in many states it still remains underdeveloped. Hydropower development could be really challenging and risky. While large storage hydro may persists the immense profits to society, along with the biggest risks. Reservoirs creation sometimes means transfer of whole communities, extensive changes to river ecosystems plus the flooding.

In the country an estimation of SHP (less than 25 MW) ability of approx20K (MW) and out of it as on 31st march only 3,816(MW) of the total installed capacity which is inclusive of the grid connection plan and off grid connection power plant. In figure below we can see that the project capacity which is still achievable is highest in state of Uttrakhand being 174.04 MW, as compared to other states. Jharkhand's capacity yet to be achieved is slightly lesser being 173 MW. Despite, the state of Jammu and Kashmir and state of Himachal Pradesh has similar geographical conditions as state Uttrakhand, still the achievable capacity by them is 17.65 MW and 76.20 MW respectively. Uttrakhand's potential and capacity is much unachieved on comparison with its neighboring states, we see that Uttrakhand is lacking behind in harnessing its potential.

STATE WISE NUMBERS AND AGGREGATE CAPACITY OF SHP PROJECTS (UPTO 25 MW)							
POTENTIAL, INSTALLED & UNDER IMPLEMENTATION (as on31.03.2014)							
Sl. No.	State	Potential		Projects Installed		Projects under Implementation	
		Nos.	Total Capacity (MW)	Nos.	Capacity (MW)	Nos.	Capacity (MW)
1	Andhra Pradesh	387	978.40	68	221.030	13	32.04
2	Arunachal Pradesh	677	1341.38	149	103.905	44	22.23
3	Assam	119	238.69	6	34.110	3	12.00
4	Bihar	93	223.05	29	70.700	5	17.70
5	Chattisgarh	200	1107.15	9	52.000	4	115.25
6	Goa	6	6.50	1	0.050	-	-
7	Gujarat	292	201.97	5	15.600	-	-
8	Haryana	33	110.05	7	70.100	2	3.35
9	Himachal Pradesh	531	2397.91	158	638.905	33	76.20
10	J&K	245	1430.67	37	147.530	7	17.65
11	Jharkhand	103	208.95	6	4.050	8	34.85
12	Karnataka	834	4141.12	147	1031.658	23	173.09
13	Kerala	245	704.10	25	158.420	11	52.75
14	Madhya Pradesh	299	820.44	11	86.160	3	4.90
15	Maharashtra	274	794.33	58	327.425	9	43.70
16	Manipur	114	109.13	8	5.450	3	2.75
17	Meghalaya	97	230.05	4	31.030	3	1.70
18	Mizoram	72	168.90	18	36.470	1	0.50
19	Nagaland	99	196.98	11	29.670	3	3.20
20	Orissa	222	295.47	10	64.625	4	3.60
21	Punjab	259	441.38	47	156.200	11	19.45
22	Rajasthan	66	57.17	10	23.850	-	-
23	Sikkim	88	266.64	17	52.110	1	0.20
24	Tamil Nadu	197	659.51	21	123.050	-	-
25	Tripura	13	46.86	3	16.010	-	-
26	Uttar Pradesh	251	460.75	9	25.100	-	-
27	Uttarakhand	448	1707.87	99	174.820	46	174.04
28	West Bengal	203	396.11	23	98.400	17	84.25
29	A&N Islands	7	7.91	1	5.250	-	-
Total		**6474**	**19749.44**	**997**	**3803.678**	**254**	**895.40**

Figure 1.1: Capacity of SHP (State Wise)

1.4 TYPES OF HYDRO POWER

Every hydro plant is unique in its design, location along with the impacts that is created of it. Although no direct proportional ratio has been established of the installed capacity with the impacts arising out of the hydro power plant, yet in general one can expect higher impacts as the size of the project increases.

Large Hydropower -The ministry of new and renewable energy sources defines the facilities of hydropower that have a capacity of more than 500 MW are termed as large hydro power plants

Small Hydropower -The ministry of new and renewable energy sources defines small hydropower as projects that generate 2001 to 25000 KW.

Micro Hydropower –The plant that has capacity upto 100 KW is termed as micro hydro power plant. With the electricity produced by a micro hydro power plant, that generation can only suffice for a home, farm, ranch, or village.

Small hydro can, if responsibly implemented, be environmentally and socially low-impact and provide many of the benefits of new renewable, in particular contingent upon power and developmental benefits for remote areas for the communities living over there. Kinetic energy is primary source for the generation of electricity if put in simplified language, it just movement of water. Upto 30MW generation of power is typically done by a small hydro power plant. Systems of Small hydropower can be installed in small rivers, majority of SHP's have been constructed on a run-of-river schemes or carried out on the infrastructure which is already in place. As it is very adaptable, low in terms of cost and renewable source of energy, SHP's are much up-coming options towards the production of more sustained and cheap energy in rural or developing areas.

In India there is about 20,000 MW potential which is evaluated that of a small hydro (equal to or below to 25 MW station capacity) as per it about utilized capacity is 3632 MW. Out of the total

grid collective power generation which was installed, 2 per cent must be derived from small hydro, that is the target is that, a target of adding 1400 MW during 2007- 2012 was accomplished. The Indian small hydro power (SHP) development program got a new rhythm following the liberalizing of the economy and affront of the financial department in a private setup of the power generation sector. Currently, the small hydro power programs are consistently driven by investment. Generation of electricity from small hydro has become progressively combative with equipage tariff. To boost dependability, quality and reduce costs the main challenge and target. Cost reduction is the major focus of the Small Hydro Power program along with establishing the reliability and construction of new SHP's in new areas in order to give create maximum capacity implementations.

1.5 SMALL HYDRO POWER IN UTTRAKHAND

In Uttrakhand special attention is being given by power planners to accelerated development of in the hydro business industry as it is significant source of energy for making sure that power energy in the nation is secured. As it's known already, Many advantageous are known of the hydro power energy ass compared to any other energy source. 1474 megawatts (MW) of capacity has been installed by Uttarakhand, along with the appointed stake within the sector which is central as on 31 March 2016. Among the installed capacity, the stake of the Hydropower sector os approximately, 986 MW and 144 MW, respectively. During 2015-16, the state Uttrakhand reported its requirement of power energy of 5155 million units (MU) for its energy demand and 991 MW for its peak demand.. The availability of power was not enough as compare to the requirement which resulted in the energy shortage in the state and peaking dearth of 2.9% and 13.5% respectively. In sector, Uttarakhand Jal Vidyut Nigam Limited (UJVNL) is operating and moderate-sized projects with a grand total installed capacity of around 986 MW, on the other hand there is a contribution of nearly 144 MW by central sector.

When it comes to hydropower projects this presumes additional significance in view of the fact that these are usually positioned far away from the load centers and the terrain often expresses momentous right-of-way issues. This calls for amalgamation of power from various projects,

development of high capacity transmission corridors, use of new technologies, staged development.

1.6 Background of the Study

Developing a hydro project are often challenging. Due to revolt in some areas safety could be a matter of concern along with the never reducing equipment prices due to the limited number of players. While on our search to find barriers of development to small hydro power sector in Uttrakhand we also came across some report such as –

A study investigated by Economic Times (8th July,2013) reported that the Cost over-runs has been observed to be 1.6 lakh crore, according to the estimation given by the Power Ministry, there has been delay of approximately 551 projects against an investment of Rs. 150 crore. Further, it was reported by NSDC, that Sector wise purpose for schedule over-run - Manpower insufficiency and lower productiveness: the industry was going through critical deficiency in standard skilled staff and employable workforce. The output has also been low because of them being old-fashioned. (sector, 2012-17, 2017-22). Another investigation also reported that, an ingenious skills lacking is responsible for the excessive delays in big-ticket infrastructure projects as clumsy red tape and backward land acquisition, according to a government-commissioned study on projects facing cost over-runs worth lakhs of crores. Leading to a staggering 80% of the developers are unable to find skilled project managers and blue-collar workers to execute projects on the ground, as per the ministry of statistics (Times, 2014). At various national and international conferences it has be discussed ample number of times that the insufficient manpower or lack of skill in the industry has been cause of anxiety for a very long time. This in turn has been affecting the cost and schedule of the power projects. One observed factor contributing to skill shortage is of the other lucrative offers in better locations leading to movement of professionals away from these projects which are typically present in remote hilly areas. (IJETAE, 2013)

The problem of manpower shortage is not only because of lack of skills, in addition there are a number of contributing factors for shortage of manpower in the small hydro power industry. Numerous hydropower projects are situated in remote areas in states which lack sufficient need for electricity. This creates the need for enhancing enabling infrastructure for power eviction. Lack of schools, hospitals and complex access to locations usually become barrier to moving skilled staff to effortful project sites. Project developers should contribute to building up of skilled man power in the project sites in different trades needed by the project to promote better employment opportunities to local population. Existing ITI may be adapted by them to provide modern workshop facilities, arranging guest faculty to train the instructors and students. In areas where ITI is not existing, new ITI could be opened by the project developers. The abovementioned activities should be considered timely. Pre-commencement of the construction phase in the hydro power projects, availability and surety of manpower by the contractors must be estimated well before time. Also, other contributing factors like access roads, and management related aspects should be controlled timely within designated time frame. (Policy)

1.7 SUMMARY

The aim of constructing this chapter was to point management concerns in the sector of hydro power energy in the country. An approach has been followed in the chapter for the purpose of reviewing the present status and possible future of Indian hydro power sector which narrows down to reviewing in-depth actual v/s potential analysis of the 'Small Hydro Power industry' in India. Inquiring further deeper in the small hydro power industry the study indicated towards the alarming position of the actual position v/s the potential achieved within the state of Uttrakhand. Thus the study followed a strategic outline to interrogate the various reasons aforementioned in various government reports, news reports, and statements by the industry itself which would be possible significant barriers to acting as hindrance in achievement of long-term sustainability of small hydro power sector. Hence, barriers and challenges with the aspect of management towards achievement of sustainable future were finally exposed. The study finds that the aspiration of mobilizing of small hydro power in the region up to its potential is because of the scarcity of skilled manpower being certain specialist roles, as one of the major reasons for the delay in achieving the maximum results.

Hence, it may be inferred from the above discussions is that "Inadequate availability of skilled manpower at the execution stage is leading to cost overrun in Indian small hydro sector"

CHAPTER 2- REVIEW OF LITERATURE

2.0 INTRODUCTION

The review of literature has been conducted in order to get an understanding of ground challenges in the small hydro power industry which is owing to high cost and schedule over-run problem. This will help the study define the further course and design of action to help the small hydro business scenario in Uttrakhand.

In this chapter, the study have done review to identify significant research gaps to help with design a plan which will indicate steps towards solving the study's business problem. An exhaustive literature review was carried out for research done in the past five decades. The after-math of the study's exploration is discussed under in detail.

2.1 APPROACHE TO LITERATURE REVIEW

Lot of researchers with many studies related to the energy sector in India has focused over the energy scenario in near future without paying much attention to the management aspects in the business(Ardizzon, Cavazzini, & Pavesi, 2013)(FichtnerManagementConsulting) and studies on how to ensure smoother transaction to reach the desired future state. The purpose of this, reviews some Small Hydro power sector management concerning issues of sustainable energy(Koirala, Koliou, Friege, Hakvoort, & Herder, 2015) in the country. The review follows a funnel down approach to present the current status and possible future hydropower energy outlooks from the existing literature. This is followed by a strategic outline whose motive is to achieve long term small hydropower energy sustainability.

The study's investigations from the review have indicated that each section of review have presented the possible research gap. Each identified gap serves as the basis for next section of the review process. Hence, the organization of the review is as follows:

Section 1 discussion of the significant Challenges of the Small Hydropower Sector in Indian energy sector at present;

Section 2 paints the Challenges in sourcing 'Skilled Manpower' with perspectives specific to the small hydropower energy outlook from a quick review of some recent studies;

Section 3 discussion of the essential features of Role of Social Inclusion in Small Hydro power business scenario while,

Section 4 presents the various measures for social inclusion for such a transformation.

Finally, to conclude on analyzing each section the gap outcomes have lead us to the final research gaps of which the process is explained as the conclusion of the 'Literature review'.

In order to analyze the research gap, Literature review is done bearing considerations with a logical approach. Hence, these are:

(a) The various challenges faced by the Indian hydro power sector on a sustainable energy path at present

(b) The challenges in sourcing 'Skilled Manpower' would be sustainable in the context of the problem

(c) The contribution of 'Role of Social Inclusion in Small Hydro power business scenario' in maintaining the sustainable energy future of India

(d) The measures for social inclusion for such a transformation to be considered

2.2 CHALLENGES/ BARRIES OF INDIAN SMALL HYDRO POWER

Before the study discusses the challenges that the Indian Small Hydro Power Sector has to face, it is important to highlight a couple of facts. The potential of the small hydro power globally is considered to be in excess of 100 GW(POWER SECTOR SKILL COUNCIL, 2012-17). Nevertheless, small hydro power usually are examined to one a option within the green energy sources(Kanchan & Varshney, 2015). These projects have immense potential in the developed countries as well as the developing countries (POWER SECTOR SKILL COUNCIL, 2012-17) Although many of the possible locations where the development of a hydro power is possible, these locations are first occupied by large hydro power projects as they contribute to the development economically and development of the local region on a larger scale basis (Birol, Boqiang, Rogoff, Srivastava, & Yergin, January 2013)

LSS (2007) (Ahmad, 2007)have laid emphasis on the delays faced by the electrification program (RGGVY program), a half lesser target had been achievable. The Ministry of Power has pointed the various reasons for delay in the projects such as delaying in finalizing the contract awards, longer pre-award lead times, unavailability of suitable contractors and manpower, and delays in land acquisition as the main factors explaining the short-fall (LSS, 2007)(POLICY FOR DEVELOPMENT OF MICRO & MINI HYDRO POWER PROJECTS UPTO 2 MW, September 2014)

In a study conducted by (Chauhan & Saini, 2015), it has been discovered that the major proportion of the SHP projects are budgeted, and thus, do not demand heavy investments (Government of India documents, Ministry of Power (2017) To enhance the profitability of the projects, practices like finding substitutes, following a formalized clearance procedure, etc. must be undertaken(Nieves & del Río, 2011).

Moreover, as it cannot be seen over about steeling of a new small hydro power plant that has an ability to dominate the river eco-system and many factors of environmental concern (Wirth,

2014). Hence, for viability of these sorts of projects, maintining of sustainability and eco feirendly attitude along with local acceptability must be maintained. (Sharma, Tiwari, & Sood, 2012). According to the author chauhan and saini (2015), many challenges and concerns were common within the energy department board.. This allows one to evaluate the parameters most vulnerable to get deviated in the implementing stage of the unified renewable energy system. Some are as under:

a) Technological barriers- Factors like reasoning of energy shortages in rural areas, causing low data management of easement in resources and diminishing stability of energy sources which are renewable in nature despite the desperate requirement to store energy (Aggarwal & Chandel, 2010)

b) Skilled manpower- One of the biggest challengesin the organizations today, as humans in place of resources are less reliable with context to the category (Cernea, 2004) Factors contributing to such circumstances would be an inadequacy can be the low will power of the experts/technicians involved- desire to contribute in the rural side of the county(Kanchan & Varshney, 2015)

c) The feeble organizational structure in management of financial aspects - One significant barrier inducing lower refunds and growth rate is also slow (Chauhan & Saini, 2015)

Letschert and McNeil (2007) stressed on another barrier in the implementation of SHPs is that the inadequate supplies and difficult geological regions result in high cost and time investment in the construction of these projects(Agency, JUNE 2012)(Abudayyeh, 1994) It would not be incorrect to declare the population residing adjacent to these small hydro projects, the main reason behind the same. For they demand jobs that they have no proper technical knowledge of, capped with an unfairly high compensation(García-Álvarez & Mariz-Pérez, 2012). As per (Abudayyeh, 1994)(Albanese, 1994)(KPMG)the real challenge is of the building of such plants, no doubt would require immense manpower, which is hard to be found in such locations. In order to construct a confident and friendly environment program for SHP’s and enhancing of the various

state working conditions, the solution is to attract private developers to kick start exercise on the financial front (Oliveira, Cassidy, & Coelho, 2015) and arrange for the interest in the small hydro power projects to be made online, in order to invite the interest parties in a convenient setting (Sharma & Thakur, 2015)

Other feature as per the study conducted by (Ardizzon, Cavazzini, & Pavesi, 2013)(Chenoy, Gupta, & Venkateswaran) highlights is that some of the barriers are common to all the member states. As all the member states have a financial groups with similar interests, geographic, political and organizational surroundings(ENERGY STATISTICS 2015, 2015). For instance (McQuaid & Bergman, 2016)(Menegaki, 2013) cite that the small hydro power barriers in Europe are all administrative in nature- barriers like delays, lack of co-ordination between authorities, lack of co-ordination between authorities and local population, difficulty in finding required appropriate manpower, elevated cost for acquiring license, lesser planning of the space, connection of the grid and problem accessed along with the infrastructure that has been in existence that would be necessary owing to the intermittent nature of small hydro power sector(Sovacool, 2014)

In a study by (Graus et al., 2007; Chikkatur, 2008),minimum method have been devised within the framework of maintenance of the small hydro power systems. The authors (Kearney, OCTOBER 2009)(C.Bhattacharyya, 2010) and (Kacan, 2014) all together have discussed about the fact that manpower with technical skills is usually not available so as to cater to the requirements of the industry. Moreover, as per the author (C.Bhattacharyya, 2010) and (Kacan, 2014) Energy Development Agency's needs to be restructured towards focusing for extending desired support for hill-based and proliferating inventive technology on a huge scale.

It is clear, that properly documented (Golov and Etlo, 1996; Brown, 2001; Reddy, 2003) planning of the curriculum fails because of efforts made in extention of education programs towards creation of awareness amongst Mc'oNeil et al. (2008) indicate that the hydro power energy should be created as formal syllabus for students pursuing graduation and higher studies.

Dilio et al. (2009) suggest that the raising requirement in saving the enrgy would offer quite a lot of potential in the country (of the order of USD 11 billion) also there should be program to create awareness amongst the community . Observations from the study conducted by (Dahan et al., 2010; Perez-Aleman and Sandilands, 2008; Stanton and Burkink, 2008) show that despite the many options yet it will be difficult to enhance the efficiency of power projects in the coming future. However, Stanton and Burkink, (2008) study focused towards the estimation of the potential in small hydro power plants which may eventually improve technology to further escalate the profits. Handfield and Nichols, (1998); Seuring and Müller, (2008) conducted studies that have examined another issue which arises is that regarding electricity .The latest estimates from (Industry, October 2010) observes some significant factors that has been emphasized year after year would be the lesser supply of power in remote areas. In a research by (Mulugetta, 2007), suggested that the contribution of employees can be held responsible. Therefore, research work done by Clarkson (1995) will help us established with some degree of impact on the factors concering human aspects over the financial cost in the power project, which would further assure the excellent performance abilities. Not only research by Clarkson (1995) but also research by Olsen and Boenbaum (2009) identified several of these other problems similar on ways to create an excellent channel of distribution via employment of human resources (Sahoo, Varma, Lall, and Talwar, 2015)

Denial of access to electricity is a critical challenge which would prevent the accomplishments in inclusion of social factors, mostly found in Bottom of the Pyramid area(Hatzl, Brudermann, Reinsberger, & Posch, 2014) The hurdles that pop owing to the intricacy and uncertainty for development and sustaining that have been drawing the consideration for management of people in policy making and academics with significance to stakeholders relationship towards implementing the sustained business model (Gkatsou, Kounenou, Papanagiotou, Seremeti, & Georgakellos, 2014). A sensitivity test was conducted by (Mohankumar, Amirthalingam, & Ramesh, 2014) to assess the factors that lead to the increasing cost of electricity generation. Further study by Mishra, Khare, & Agrawal, (2015) shows that SHP is not applied to its

optimum capacity. The ability of small hydro power projects may be enhanced by the duration of supply of power to the remote areas in the country (Mishra, Khare, & Agrawal, 2015)

Another important aspect of the research by Danse and Vellema, (2006); Ras and Vermeulen, (2009) of development on the sustaining front that stressed to the requirements in order to preserve the factors relating to the economy, social and environment for generations in the near future. The idea draws important factors in the area of business and more recently is observed to influence the organization and its practices (Matos & Silvestre, 2012)

The study done by Silvestre and Dalcol, (2010) could be used for analysis reasons with significance to the future energy obligatory agreements. (Dhingra, et al., 2013). (Liarakou, Gavrilakis, & Flouri, 2016) Suggests that factors contributing for the same may be assumed to be that smaller country may endure a smaller scope in specialty, which makes them be dependent on imported technology. Hence, they are weak in terms of being technically efficient (Limited I. M.). Therefore, the analyzed observations have been drawn upon (Agency, JUNE 2012) in course of the research which implies that it would be applicable to developed countries that seem to be deriving benefit from the RES investments (Menegaki, 2013)

(Chen, Huang, & Liu, 2013)(Koschel, 2013) have laid a great emphasis on the importance of training, which would further cultivate many alternatives for income generation. For instance, in spite of providing consumers with subsidies, promotion of renewable energy may take priority (Aggarwal & Chandel, 2010)

Many areas are embraced in Resource management like, resources of finance, humans as resource for organization, resources which are naturally available. The author Chua et al., (2010); Johnson,(2009).emphasis on , among these many resources only financial and humane resources are considered for concision. In today's world, to find an approrpirate person for the job is a big challenge for the industry (Turnera & Mu¨ llerb, 2001). The needs of the industry are rapidly changing, and with these changes the industry demands for workforce with expertise, which is

difficult to procure and retain. Similarly, GOI (2007) has published a report in which it clearly describes that in the 11th Plan and for the 12th plan, the hydro power industry will require 0.6 million manpower or even more (POWER SECTOR SKILL COUNCIL, 2012-17)(Uttarakhand, 2015) reports that the requirement would increase if one considers the need for the construction work of power plants and networks and if renewable energies and decentralized mode of their operation are considered. Similarly, the oil and gas industry is facing a shortage of manpower globally (Agency, JUNE 2012). As per the reports from KPMG (2015), the academic knowledge from the universities provides the foundation but requires further training supplements for practical and industry specific skills (Arouri, Youssef, Henni, & Rault, 2014)(NSDC, District Wise Skill Gap Study for the state (2012-2017, 2017-2022), December 2013). Moreover, as the industry evolves, new horizons appear both technically and otherwise. These require additional skills for adaptation to the new environment. This therefore requires proper education planning and quality control systems (Albanese, 1994)(Lambert & PereiraSilva, 2012). Simultaneously, the demand for unskilled workers also increases as the construction and project activities multiply(Kanchan & Varshney, 2015). It has been reported that contractors of rural electrification projects had difficulties in sourcing laborers for their projects implementation, leading to delays (LSS, 2007). Such problems are likely to aggravate with a higher level of activity (Hall et al., 2009, 2011, 2012) . For example as discussed by Bordewijk (2006) that attracting manpower is an issue, there are other human resource-related concerns as well. Bordewijk (2006); Garcia, (2007) argues that in a changing industry, where the centralized office-oriented works would yield room for jobs in more decentralized and remote areas, the deployment of staff can be an issue. Further, According to Vedana (2009) managing the change in the public utilities will be crucial to adopt a more commercially oriented culture and a transparent, open attitude to work rather than a common-and- control type of management. There is resistance for change especially in the organized public sector and overcoming such challenges tends to be a time-consuming process.

However, according to Frenkel and Scott, (2002); Sanchez et al., (2006); Kaltoft et al., (2007); Stanton and Burkink,(2008) a better standard of their living. But one of the most disturbing factors argued by Goldemberg et al., (2004); Ruiz and Rodríguez-Padilla, (2007) ; Gomees et al.,

(2002); Bahieense, (2005); Silvestree et al., (2010b). has suggested for finding solution to problem such as strategy for sourcing talent that is required, identify of local resource, better management practice to assure sustainability in growth of the power industry (C.Bhattacharyya, 2010)

Summary of theme 1 - Keeping the above done researches in consideration, the study's literature review exercise intended to investigate the problems of inadequate availability of skilled manpower which is leading to cost overrun in Indian hydro sector. As supported by various other researchers from around the globe, it was observed that the issue is becoming a rising global concern. Literature review on theme 1 which is 'Challenges in the Indian Small Hydro Power Sector' has directed towards a gap being 'Most of the studies identifies scares availability of skilled work force as a challenge to Indian Hydro power sector but none of them addresses the reasons to it'. This in turn leads to further investigate what are the actual challenges as well as the scope of sourcing skilled Manpower

2.3 CHALLENGES IN SOURCING SKILLED MANPOWER

Human skills are considered to be a new currency lobally (aiez et al., 1998; Faaij et al., 1998; European Commission, 1999a; EWEA, 2004; Barkenbus et al., 2006). Author Marikandya (1998, 2000) (Saran Agarwal & Kansal, February 2017)suggests that in order to come at par with the skill shortage, employer might consider initiatives for not letting the mature worker feel neglected. The Power secretary and the Minister of Power in 2012-13 signed 'A Framework Document' (RfD) which shows that the achievements to Capacity building of addition of 15956 MW has been agreed upon. Signing of the document has proven to be effective, such as at training of 16225 Persons at NPTI was required (KPMG). As per Marikandya, (1998); European Commission, (2005) the targets would be achievable in a situation when hydropower would invite changes in work environment. Leonntief, (1966); Oiknonomidis, (2007) suggests that the organizations would be able to if they hired managers with experience within other sectors who

would be able to rely on . The suggested practices as per Lenontief, (1966); Oikoonomidis, (2007) consists are as follows (a)

A critical evaluation by Rubio and Varas, (1999); Weisberg et al., (1996); Schuman and Stanley, (1996);Boettcher et al. (2008) explains that the job ratios are often used to justify claims that specific forms of renewable energy technology can create a certain amount of jobs. Kulisik et al., (2007) supports and further suggests that this must be done with care however as there is a large range of job ratios for each technology. As per research conducted by Mattas et al., (2014); Miller and Blair, (2015).

The labor intensity of small hydro power energy has been discussed by Frondel et al., Michaels and Murphy & Friedmann, (2009); while analytical methods generally only determine direct jobs there can be some ambiguity surrounding what is a direct and indirect job. Generally direct jobs refer to manufacturing only but in some cases installation is also included Laitner and McKinney (2008). Goldemberg (2009) considers job 'shifting' from one economic sector to others. The workers that are employed in the small hydro power industry may not come from the pool of unemployed, a point vigorously highlighted by Michaels and Murphy (2016); Bezdek, (2014). At least some of the skilled workers will move from another job, resulting in no net increase in employment. In addition input–output analyses assume an unlimited pool of unemployed Kenley, 2004 nuclear study and Stoddard, 2006 hydro thermal report) an unrealistic assumption that could cause overestimation of the creation of employment.

During course of study by Lehr et al., (2008) it was discovered that the ratio between the availability of skilled and that of unskilled labor was highly disproportionate. As the unskilled labour available was in quite abundance as compared to that of the skilled labor (Hair and Anderson, (1998); Narsky,(2003); Myatt,(2007)

While job ratios can be used to describe the amount of jobs that are created, describing the type of jobs created is much more difficult (Bontis et al., 2002). Usually temporary jobs are considered

less skilled than more stable jobs. A novel approach to describe the quality of jobs created was introduced by Sastresa et al. (2009). To give an indication of the local component of a job and the skill level required (Satresa et al, 2009). Thus, to summarize, it is safe to say that the employment benefits derived from small hydro power projects do not suffice in compensating the produced environmental damages (Tourkolias, Mirasgedis, Damigos, & Diak, 2009)

The results of the analysis by Nardone et al., (2005); Shaffer,(2006) also presented the relative impact of small hydro power energy on employment (Gliem and Gliem, 2003; DeVellis, 2003). Similarly, there is no single clear word regarding whether small hydro power energy effects employment positively or negatively (Dnaindia, (2006); Hindu, (2006) ; (Lambert & PereiraSilva, 2012)

The above discussion clearly reflects the future that will prefer renewable energies to create more jobs in Construction and Installation than in Operation and Maintenance sector. Also it can be estimated that there is a risk scarcity of construction professionals in the coming years .

Barry and Chapman ,(2009); Devine-Wright, (2005); Rogers et al., (2008); Warren and McFadyen, (2010) supports that there is a skill gap even for re-employed (experienced) manpower, if they have not kept themselves updated. This portion of the study highlights the serious repercussions of skill gaps. Studies by Agterbosch et al., (2009); Breukers and Wolsink, (2007); Musall and Kuik,(2011); Toke et al., (2008); Wolsink, (2007) warn that “Technology related skill gaps (if not corrected) will damage the small hydro power sector in the Indian Economy.

Thus, taking into account the skill requirements in small hydro power employment our educational planners must guarantee a proper environment to obtain the required qualifications for these new jobs. To support the fact, here under is a research by Agterbosch et al.,(2004); Markard and Petersen,(2009) which throws light upon the scarcity of qualified workers. The findings from Agterbosch et al.,(2004); Markard and Petersen,(2009); Marquis et al., (2007); Scott, (2008) can

be summarized as follows: Jobs are now more widely spread across the EU than they were 5 years ago, reflecting the emergence of new hydro energy markets, France (Sousa-Poza and Sousa-Poza, 2000), Italy (Raphel, 2004), Ireland (Rose, 2001) and Portugal (Shaffer, 2000). are especially dynamic. Agterbosch et al., 2004; Markard and Petersen, 2009). Geels and Raven, (2007); Köberle, (1994); Wirth et al., (2013); Umbach-Daniel, (2002) stresses that the scarcity of suitable candidates for the hydro energy industry creates a trouble for especially the positions that require a higher degree of experience and responsibility. During the research conducted by Raven and Gregersen, (2007); Raven and Geels, (2010) and during qualitative interviews conducted by Raven and Gregersen, (2007) within the scope of the author, another significant observation was that the occupation requirement often neglect the women candidates who might be potential workforce. Hence, Geels and Raven, (2007); Köberle, (1994); Wirth et al., (2013); Umbach-Daniel, (2002) marking the urgency for promotion of education with training and development of skills which would give more opportunities for women, who otherwise are used to being denied the benefits of small hydro energy jobs opportunities which are closer to their location (e.g. Hargrave and Van de Ven, 2006; Rao et al., 2000; Sine and Lee, 2009).

As per Lakhani and von Hippel, (2003); O'Mahony and Ferraro, (2007); von Krogh et al., (2003), the explaination could be the analysis of skills which would upgrade the quality and help in creation of space to train for vocational courses. Secondly, Brown and Duguid, (1991); Brown and Duguid, (2001); Wenger, (2000) suggests that women can be motivated by spreading awareness about their rights and power to transcend the organizational hurdles like working hours and childcare services. (Rustico & Sperotti, 2012) Additionally, the immediately available data on reasons for lower employment opportunities show that it is only the high-skilled labor that is required in this industry, whereas, the labor readily available is low skilled (e.g. Hargrave and Van de Ven, 2006; Rosenkopf et al., 2001). Hence, calling for better training and education to help workers evolve. Similarly, Thornton et al., (2012); O'Mahony and Lakhani, (2011) argues that strong gender bias in the industry obstructs the entry and retention of the best staff and also demotes social equity. Hence, scarcity of skilled workforce, due to whatever reason, proves that skills remain a major issue for the hydro power industry and more specifically the small hydro

power industry. Südtiroler Bauernbund et al., (2007) believed that the promotion of 'green jobs' should not only consider "Work first" approaches to help unemployed people find jobs, but it should also remember the significant investments in the human capital and hence, focus also on "quality" of employment. In Scotland, the overall development of small hydro power industry and their equipment are highly integrated with the European Union (Oliveira, Cassidy, & Coelho, 2015). There have been specialized skills programs put forth to meet industry needs, although it is too early to estimate their long term effects. (Wei, Patadia, & Kammena, 2009)

The reported shortage by TIS innovation park, (2010) of skilled workers owes its existence to lack of understanding of the companies' needs and of the labor market conditions. Also, it must be found out whether public action can encourage a flow of workers from educational centers. Given that the small hydropower energy is an emerging industry, it is essential to establish a contact with customers in order to transmit the technical characteristics of the products (Thornton, 2004; Thornton and Ocasio, 2008). Employees who could shoulder this job are required to have good interpersonal, communication and organizational skills, and, at least, a basic technical knowledge. A suitable educational background based on the marketing field will be highly appreciated (Davis and Marquis, 2005; Marquis et al., 2007; Scott, 1995).

In the case of jobs based on management (such as administrative manager, planning consultant or project manager), employees undertake tasks that are not directly linked with the core activities (Brint, 2001, p. 8). Different resources of the enterprise are coordinated to obtain the established objectives. These employees again should have the same organizational, interpersonal and communication skills. Sastresa et al. (2009) implies that more specialized jobs in the technological development stage are of a quality higher than operation and maintenance jobs. While specialized jobs may attract a higher income it seems a somewhat judgmental argument to believe that operation and maintenance jobs are of lower quality despite the fact that they provide local jobs to people with low specialization (Südtiroler Bauernbund and Energy and Technology, 2006; Südtiroler Bauernbund et al., 2007; Scheibler, 2008; Bozzo et al., 2011). In the case of small hydro power energy placed in a rural location, jobs with low skill requirements have been

proved to provide more employment benefits to the local community than high-skilled jobs, because of the presumably low skills of the rural workers (Walker et al., 2007). The greater the need for low skilled workers, the greater the positive impact on the community, with spurting job opportunities. With demography in small hydro power sector's favor and a panorama of young candidates waiting it is an opportunity for HRM in small hydro Power sector to showcase its ability to be a lucrative center. The review by Centre for Sustainable Energy (CSE) et al., (2007) suggests that, at a local level, the introduction of small hydro power energy technologies will mark a change in the the existing energy mix and an upsurge in energy independence (Koirala, Koliou, Friege, Hakvoort, & Herder, 2015). The research by Lesbirel and Shaw, (2005); Wolsink,(2007) suggests that renewable energy projects can cause hostility among localities and can spark controversies. An institutional mechanism for setting up Regional Skill Development Centers by pooling resources from Power Developers, Manufacturers and Contractors to increase the availability of trained and skilled manpower (Dhingra, et al., 2013).

Summary of theme 2 – On the journey to investigate the various challenges to source appropriate manpower in the small hydro power industry, many researchers have pointed towards one significant aspect where they all have collectively indicated towards the role of social inclusion as one possible method to the above said challenge. The gap observed from the review was 'Researcher could not find any comprehensive study indentifying activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttarakhand' Hence, the study marched towards doing further review to understand the role of social inclusion in Hydro Business Scenario.

2.4 ROLE OF SOCIAL INCLUSION IN SHP

It must be obvious by now that clean energy like small Hydro power energy has the capability to promise many domestic jobs, and others that are guaranteed to stay domestic as they involve construction and installation locally (Singh et al, 1994; Valappil et al, 1994; Banham and Brew 1996; Dwivedi 1997). As it is slightly difficult to trace which factors influence citizens'

willingness to volunteer for a community energy project or invest financial resources, the need for such research has been highlighted by Aylett (2005) and Wandersman et al.(2003). In response to this need, the study by Batliwala, Reddy (2007); Laxmi et al., (2008) detects citizens' willingness to volunteer and invest in community's small hydro power energy projects. To develop effective strategies to encourage active participation, it is first important to identify the factors that affect their willingness to participate (Mishra, 1999; Peon et al., 2005). It was discovered by Dutt, (1994); Mills, (2005); Van der Plas and de Graaff, (1988) that local engagement, financial resources and governmental support are needed for the mobilization and success of community's small hydro power energy project. Participation in community's small hydro power energy project is promoted by contacts at the local neighborhood level. Involving citizens as employees or volunteers can be an important means to support local small hydro power transition projects (Sanchez et al, 2007, Sanchez et al, 2009). The projects should consider the importance of social aspects to motivate citizens to invest their skills in building resources (Almaz, 2005). The relevance of social norms raises a need for a social norms marketing approach that could be implemented to influence citizens' social expectations and foster participation in community small hydro power projects, by creating a "salient social pressure". Individuals involved with community energy projects or influencers such as opinion leaders within the communities could use this means to promote community's small hydro power energy. In terms of process, the author Roger (2008) finds an observable links in survey of local residents suggested that involvement of local people in a project is directly proportional to the level of project acceptance and support, and this involvement can be proven to have only positive impacts. (Devine-Wright et al., 2007) However, it is important to learn that the improvement in local employment is influenced not only by job creation but also the community members' willingness to take those jobs. The trust mediates the effect of community identity on the willingness to participate in a local community small hydro power energy project. The findings from Najam and Cleveland (2008) show that trust and social norms fully umpire the relationship between community identity and willingness to participate. According to the World Commission on Hydropower Dams (WCD, 2005) one important role of community identity was identified and that is that it is an antecedent that facilitates the

formulation are likely to not serve the purpose of collective interest. (Bauwens, Gotchev, & Holstenkamp, 2015)

Moreover, it cannot be denied that it is under-employment and under-training that emanate the deficit in skilled staff for dam and auxiliary constructions (Dunning and Turner, 2005). In such a situation labor from outside is imported in order to substitute the under-qualified local labor. The study describes (Walker et al., 2007b) that the energy sector is a highly vast sector comprising various factors, different form of organizations, multiple sets of objectives serving different purposes, and many different practical strategies and technologies to achieve their respective goals. It is, therefore, quite difficult to diagnose specific features of this sector as a whole, or even to categories these diverse groups (Hinshelwood, 2001; Walker et al., 2007). Here a challenge arises for the government to relate each parameter more effectively to best achieve the sustainability goals (including but extending beyond energy) of these groups (Development work by DVC, 11/01/2016). Performance appraisal and project monitoring must acknowledge multiple sets of objectives, for example, avoidance of single dimensional criteria (such as carbon dioxide emissions reduced or kilowatt hours of energy produced). On the contrary, considering the civil society, its success lies in engaging the local communities, and making the sector quite distinct by inviting not just one certain group of people to participate. (Seyfang, Park, & Smith, 2013) This also leads to their better understanding of small hydro energy project. (Walkera & Wright, 2007). Another segment of the study by Loring, (2007); Toke, (2005); Walker et al., (2007b), attends to the significance is that, the Project can raise awareness of renewable energy technologies and increase share of renewable. In a nutshell, through case study the researcher (Bolinger, 2001; Stamford, 2004) were successful in altering the local social context for development of wood fuel heating, therefore reducing the risk for all involved factors in the future development of this sector. There was some evidence of increased engagement but it was limited to only the direct participants, suggesting local projects need to be supported by wider systemic change to maximise impacts. (Rogers, Simmons, Convery, & Weatherall, 2011) explains that a Community-owned small hydro power energy is proved to be beneficial as the intention of people to live in an area for a long duration and have family and children literally embeds an individual within a community,

increasing both the opportunities and incentives to participate. This can be achieved only if the participation is not influenced by the racial, occupational or educational status.(Wandersman, Florin, & Friedmann, 2016). Furthermore, some major findings were discovered during by Loring, (2007); Toke, (2005); Walker et al., (2007b), which have many laws at international level signed up and require consultation with public. Loring, (2007); Toke, (2005); Walker et al.,(2007b), also reveals that there are several government policies that lay significant emphasis on giving special privilege to the poor. The importance of local people has proved to be a prerequisite for the success of the project, also because the potential buyers of the produced electricity via small hydro power sector are already in queue, ensuring very less chance of financial risk (Kahssay & Mishra)

Summary of theme 3 - The purpose of the review is to make valuable contributions to discussions about involving the community in successfully harnessing small hydro power energy. The first discussion is metaphysical in nature as it encapsulates analysis of various challenges in increasing the results as we have a huge potential of small hydro power energy. Our review lead us towards an observation where 'sourcing of appropriate manpower' was indicated as one of the significant challenges found at present in not only the small hydro power industry but the hydro business scenario. Hence, the review helped the study button down further deeper to understand the observed gap 'Though studies on social help group indicates the types of social participation needed to mobilize the resources but the researcher could not find adequate study indicating the role of society with respect to small hydro power industry' variegated contrivance and dimensions of Social Inclusion.

2.5 MEASURES OF SOCIAL INCLUSION

Mohanty and Mohanty, (2009); Whitmarsh, Seyfang, and O'Neill, (2011) indicate that it is necessary to detect the main competences that are required in this industry to ensure proper growth. Dias et al., (2004); Kandpal and Garg, (1999), have distinguished three types of employment a) technical jobs, b) jobs based on management; c) jobs based on customers.

Moreover, studies by Huang and Wu, (2009); Tsai, (2005) quote employment benefits are perhaps giving a false impression of the potential benefit in their region because they perhaps have been taken from other study materials. The researchers Doran and Zimmerman, (2009) further prove that the availability of skilled and semi-skilled manpower for project execution has been an area of concern. Both the developer and the contractor(s) have to make joint efforts for providing training and necessary skill sets to local people to enhance their worth and capability to do the work (Chen and Hou, 2009). Latest methods of manpower mobilization need to be adopted. Industry is facing severe shortage of skilled manpower like welders (especially High Pressure welders), fitters, turners, masons, carpenters etc. DeWaters and Powers, (2011) observed that the sustainable energy practices curriculum should be designed only after assessing the level of awareness of the parents and children with respect to small hydro power energy sources. This level can be determined with the help of a system for small hydro power energy sources and it was found that as compared to the International standards of the awareness level of students and their parents, the awareness level here is not adequate (Kandpal and Garg, 1999). Moreover, the other facts by McBeth et al., (2008); Negev et al., (2008); Shin et al., (2005) that were recorded are as under: There is no such gender biased-ness regarding the awareness for small hydro power energy sources: (a) It is observed that previous curriculum and education methods have become redundant (b) It is important for parents to maintain high awareness scores as it is directly proportional to the awarenesss scores of their children (Kacan, 2014).

During a study conducted by(North American Association for Environmental Education (NAAEE), 2011), energy literacy(DeWaters andPowers,2011), to counter check the level of education imparted, it was observed that much of the attention was being paid to the investigation, documentation and designing of the curriculum renewal strategies- to promote sustainable development.

The results Eckel, (2002); McGinty & McTaggart, (2000) show that the dimensions of small hydro power industry are responsible. Many teachers were consulted during the research, convinced that the issue could be resolved if we collectively could foster students' abilities to

apply the contextualized knowledge learned at school to deal with energy-related issues (Barrow and Morrisey, 1989; Bittle et al., 2009; Curry et al., 2007; Farhar, 1996; Gambroand Switzky, 1999; NEETF, 2002). Its benefit is that it will assist in generating the interest of students to be motivated to seek job opportunities in small hydro power sector and specialize in it. (Chen, Huang, & Liu, 2013).The findings from National Environmental Education & Training Foundation (NEETF, 2002) further suggest that the teachers who were assigned the task of imparting training of concepts related to hydro power energy sources themselves lacked the updated knowledge about the related subject. (Liarakou, Gavrilakis, & Flou, 2009). It is described by Collins and Jaeger, (2003); Hanson, (1993); NEED, (2006); Rendl, (2000) from the insights discussed, that much of the attention must be paid to the investigation, documentation and supporting of the design of curriculum renewal strategies which is aimed at sustainable development.

DeWaters and Powers,(2007, 2008) main focus of the study has been on diagnosing 'technical' measures in order to assess the effectiveness of social intervention. Also, the degree to which the interventions influence the general public are being scrutinized, too. However, the assessment of the magnitude of affect on the awareness of local people is usually not considered as a part of the control process (Zografakis et al., 2008; Stern, 1992). In order to avoid the unintended yet possible side effects of the project, and to help maximize the benefits of interventions, measurement of the impact on citizen behaviour is highly recommended(Zografakis et al.,2008). This study by Eckel,(2002); McGinty & McTaggart, (2000) concludes that the program implementation is not necessarily accompanied by large scale change. The only threat that such implementation brings is that it can create a false sense of security among the participants (Hatzl, Brudermann, & Reinsb, 2014).

Summary of theme 4 – In theme 4, the review was conducted on the various measures of social inclusion in a small hydro power plant location. The observed gap from the review was 'The study could not find any studies suggesting the measures to be undertaken for promoting the inclusion of social participation for developing and sourcing of skilled manpower'.

2.6 SUMMARY OF LITERATURE REVIEW

Further to enlighten the study on the business problem, an extensive literature review was conducted on four themes for review. Each review indicated towards the next theme to be reviewed and also helped us decode a significant research gap.

Section 1 discusses the key Challenges of the Small Hydropower Sector in Indian energy sector at present; the considerable gap decoded was "Most of the studies identifies scares availability of skilled work force as a challenge to Indian Hydro power sector but none of them addresses the reasons to it." This gap indicated to our further three themes

1. Challenges in sourcing skilled Man power : Challenges and Scope
2. Role of Social inclusion in Hydro Business Scenario
3. Measures of Social Inclusion

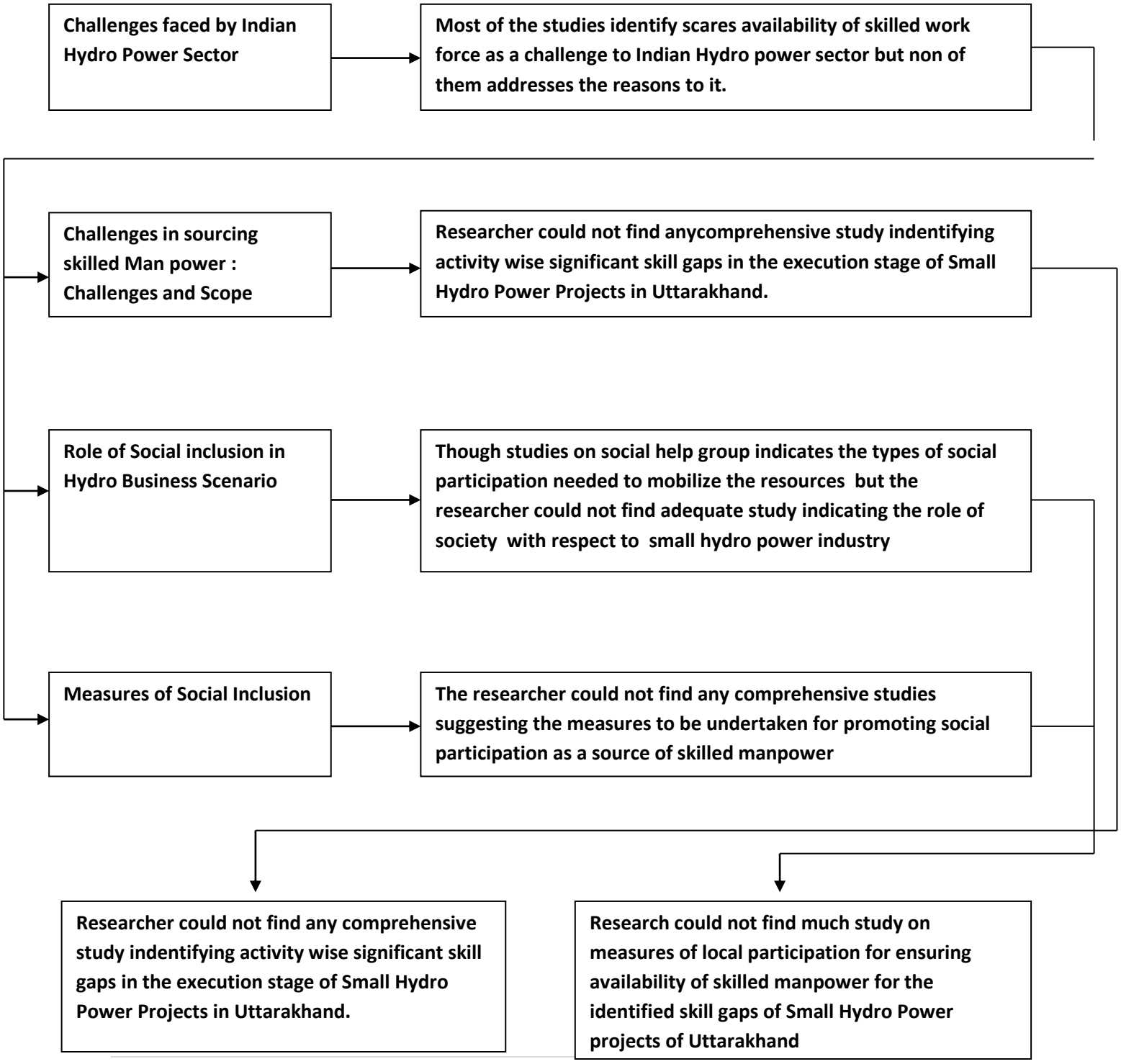
Section 2 paints the Theme 'Challenges in sourcing Skilled Manpower' with perspectives specific to the small hydropower energy outlook from a quick review of some recent studies, decoding done from this delving resulted in the gap "Researcher could not find any comprehensive study indentifying activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttarakhand"

Section 3 discusses the essential features of Role of Social Inclusion in Small Hydro power business scenario while, decoding done from this delving resulted in the gap "Though studies on social help group indicates the types of social participation needed to mobilize the resources but the researcher could not find adequate study indicating the role of society with respect to small hydro power industry"

Section 4 presents the various measures for social inclusion for such a transformation. Decoding done from this delving resulted in the gap "The researcher could not find any studies suggesting the measures to be undertaken for promoting social participation as a source of skilled

manpower". Finally, to conclude on analyzing each section the gap outcomes have leaded us to our final research gaps explained through a process in the figure 2.1 below

Figure 2.1: Identification of research gap



We can see in the above figure 2.1, Research Gap Identification Process has been explained - The outcome of gap from first theme being 'Challenges faced by Indian Hydro Power Sector' has given us our further three themes to be inspected i.e.

1. Challenges in sourcing skilled Man power : Challenges and Scope
2. Role of Social inclusion in Hydro Business Scenario
3. Measures of Social Inclusion

The Second theme directly indicated to our first final research gap being "Researcher could not find any comprehensive study indentifying activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttarakhand"

The research gap from third theme 'Role of Social inclusion in Hydro Business Scenario' and the research gap from fourth theme 'Measures of Social Inclusion' were together combined which gave us our second final research gap "Research could not find much study on measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttarakhand"

Hence, the two final research gaps to be concluded from our research are:

1. Researcher could not find any comprehensive study identifying the skilled workforce gap at the execution stage of small hydro power projects in uttrakhand
2. The researcher could not find any comprehensive studies suggesting the measures to be undertaken for promoting social participation as a source of skilled manpower

The above said research gaps directed towards our

Research Question –

1. What are the activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand?
2. What are the measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand ?

Research Objectives –

1. To identify activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand.
2. To find out measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand.

Having been directed towards the significant research gaps, and recognition of compelling research questions along with research objectives. Further, our study directed us to review the various theories that are present in the academic area, examine the particular theory which would alienate with our identified research gaps in order to advance towards our research problem.

2.7 THEORETICAL PREMISE OF THE STUDY

Today, the process of sourcing appropriate manpower for a required skill has taken the center stage in any business. Gone are the days when sourcing of manpower was not paid much of the attention to and was generally kept out of the decision circles. In the new millennium, recognizing the importance of managing the human resources has become the most mandatory function, and doing so in the global context is considered even more essential. The narration of the success story of a company in any business journal does not come without the details of on ways to manage its human resources efficiently. The environment of business would eventually expand globally, so does the need for managing people and sourcing appropriate manpower. Thus, the centre of discussion here is that to analyze and develop the aspects of global activities associated with sourcing manpower is of utmost importance. Moreover, as per the global scenario, its being very important to manage the human resources efficiently, and in order to do so, organizations have given specific time periods for the same.

Strategic Sourcing of Manpower /Human Resource Management in alignment with Business Performance

The primary objective of management strategies is to focus on improving performance, increasing productivity and reducing the costs etc. As per the authors Sten and Somerland (Sten and Somerland, 1999), The importance of capabilities with strategy will require vision to be clear. Hence a thoughtful planning must be carried out with its objectives well laid logically. Also a strategic planning is required for many skill based competency with experience to many levels in the organization. Filling if these attributes as per the required needs is basically the job of an HR (Byham, 1989).

According to Wellins, Bernthal and Phelps (2005), The problem of Skill Gap is reduced by placing the right people in the right job, pursuing exceptional leadership and by the construction of organizational systems and strategies. However, Hertzberg has a different opinion and thus,

suggests that the reduction of skill gap can be achieved with help of guided alliance in the HR system. For this purpose to be achieved, HR must keep revising and reinventing its policies, and practices to preserve this employee engagement.

As per the discussions above, developments on the theoretical strategy for reducing the problem of skill gap can be considered by robust HR theories and strategies. The analysis caters the researchers with a number of clear messages. For instance, the challenge lies in materializing the strategic roles in the working processes of the organization. This concludes that the sourcing of manpower, as a process, has become utterly crucial to any firm, and thus, the role of HR metamorphoses to match the former process in order to bring in more efficient results.

2.8 THEORIES & MODELS OF HRM WITH CONTEXT TO THE STUDY

In an attempt to delineate the differences between Manpower sourcing and management of personal (see e.g. Legge, 1989; Guest, 1991), and on journey to include industrial relation with recruitment of manpower (Torrington et al., 2005), examination of relation with recruitment strategies and integrating the recruitment strategy with strategies in business (Lengnick-Hall and Lengnick-Hall, 1989; Brewster and Larson, 1992; Budhwar and Sparrow, 1997) and the limits to which manpower recruitments work as key for achievements in advantage on the competitive front in industry (Barney, 1991). Presently, increase of recruitment of workforce has contributed towards performance of the organization and thus contributing towards an overall success (see e.g. Guest, 1997; Schuler and Jackson, 2005; 2007).

Various theories and structures for recruiting workforce – As per the human resource management area, and more specific to recruitment of workforce are being developed and demanded by aid of many theoretical frameworks (Jackson and Schuler, 1995).

Resource Dependence Theory – The relation of the constituencies and the organization in the industry formulates the Resource Dependency theory. As per this theory, the primary demand is the need for resources and then framing the policy and guidelines as the demand for resources requires.

Competitive Advantage Theory – If the resource is rare in nature then there will be a completive advantage to it, thus formulating the competitive advantage theory. It is possible to sustaining the competitive advantage theory, with help of culture followed in an organization and the process of selecting with other practices and its support.

Agency Theory – In the variety of theories in practice as per strategic Human resource management, the Agency theory is perhaps the most practices one. Legally, there is a relationship of the employee and employer in a agency format.

Human Capital Theory – With reference to humans and their productive abilities, the literature shows the theory of human capital. The brief point to be noted in the theory is of that productiveness can only be achieved with help of people who are productive in nature.

The Theory of Partnership - In particular partnerships to promote urban and rural regeneration or economic development are analyzed as these involve a wide range of actors (including central or federal government, local government, the private sector, and local communities) and the underlying issues that they deal with are multifaceted. Many case-studies of such partnerships exist (see for example, Wannop, 1990), however the more general theoretical basis for understanding and analyzing them remains poorly developed. in order to fully understand the behavior and policies of organizations involved in economic development and regeneration it is necessary to consider the nature of their relationships with networks of and partnerships between other actors, including the flows of resources, power, and information within these networks. While each partnership is a function of particular historical, economic, social and political contexts, there are many common trends. The natures of partnerships, particularly “private public

partnerships" but also partnerships between quasi-public and/or public agencies, are altering due to changing global economic patterns, government funding and changing economic structures, in both the US (Weaver and Dennert, 1987) and the UK (Harding, 1990; McQuaid, 1994, 1998).

2.8.1 Theory of Partnership with context to the study

The theories of strategies in human resource management are strategies in organizations from the above discussions. Reason why the theory of partnership could benefit from some forms of direct testing is because some of the evidence on which these relationships have been determined falls outside the realm of construction, thus leaving open the question of their validity in the context of construction phase of the hydro power industry. The concept of partnering has been a much discussed topic in the construction industry for some years and recently more interest has been shown for the concept in the study. From the literature review it is concluded that there are two necessary components in partnering - trust and mutual understanding - and that a number of different components can be added to form a specific variant of partnering. This provides a new method to define the vague and multi-faceted concept of partnering in a flexible and structured way. The approach presented is applicable for both project based and strategic partnering since the literature from which the study is based handles both. From the above discussion it may be inferred that theory of partnership may be considered as the theoretical underpinning of the study.

2.8.2 Types of Partnership with context to the study

This section considers a range of parameters that help analyze partnerships or develop models of them, in the context of urban regeneration and economic development. As each partnership has many dimensions, this section has been dedicated to them all as to combine them into a set of characteristics and thus, extract the richness of various forms of partnership. Hence any individual partnership is an amalgamation of these different dimensions. Five main dimensions of partnership are discussed as follows: a) The objective of partnership i.e. whether it is strategic or project driven; b) The key actors involved and the structure of their relationship; c) The timing or

stage of development of the partnership process and changing relationships and activities over time; d) The spatial dimension; e) The implementation mechanisms (table 1). A further set of characteristics that highlight the expected benefits of the partnership, are highlighted in the next section. Each of these dimensions for analysing partnerships also have themselves a number of axes, or sub-dimensions. However, it is important to draw a balance between increased complexity (and realism) and clarity of any typology of partnerships. Moreover, each of these components are capable of having direct implications on the efficiency and effectiveness of a partnership, which further helps form a basis to analyse these issues.

Here under are discussed a certain set of dimensions of Partnership:

Main dimensions of partnership are:

a) The purpose of the partnership i.e. whether it is strategic or project driven;

b) The architectures involved, i.e. the key actors and the structure of their relationship in the partnership;

c) The timing or stage of development of the partnership process and changing relationships and activities over time;

d) The spatial dimension i.e. where it is going to be based

e) The implementation mechanisms referring to the materialisation of the activities

The importance of partnership cannot be successfully displayed until its advantages are discussed in detail. Thereby, they are, as under:

Potential advantages of Partnership

The main advantages of partnerships can be grouped as: resource availability effectiveness, efficiency and legitimacy (Gaertner et al. 1993)

a.) Resources

The nature of the problems troubling local economies is multi-faceted, which is why a combined response from a number of private and public key actors is required in order to be effective and efficient. Collaboration between key architects is, therefore, essential for tackling the various causes (in as far as these can be tackled locally) as well as the symptoms of the problems of the local economy. This kind of collaboration is what defines partnership. Hence, formal or informal joint workings are a pre-requisite for achieving complementarity and avoiding wasteful duplication of effort.

b) Effectiveness and efficiency

Partnerships may reduce the confusion faced by people in identifying the appropriate agency and may even usher people to be able to finally select one. Also many initiatives use community activists and groups to respond to the user needs and thus, increase the participation rates in training initiatives, as prospective trainees have greater confidence and trust in such groups and will respond better to them instead of some 'outside' agency. Hence, this enables increased efficiency of the economy in place of being only a redistributive policy (especially when shortages for certain types of labour occur).

c) Legitimacy

The agenda of partnerships to involve participants from the local community directly, rather than through the representative democracy of Central and Local Government, rather legalizes its existence and use. Moreover, the many policy implementation decisions are being made by

employed officials of an elected Central or local government or an unelected quasi-autonomous non-governmental organisations, in order to enhance the legitimacy of the policies at the local level.

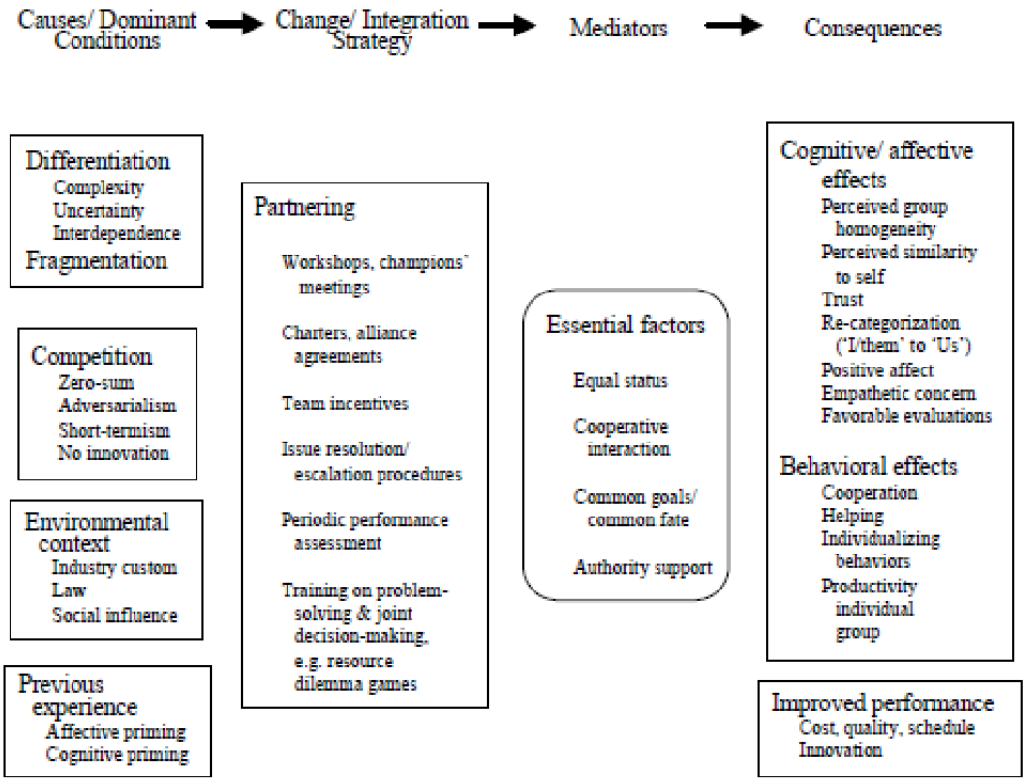


Figure 2.2: The model of partnering (adapted from Gaertner et al. 1993)

In figure 2.2, model borrows from the determinants of Partnering framework and management and organizational development theories to present the three aspects being:

1) Sine qua nons of partnership as an organization and the need for partners from multiple sectors,

2) Whether an organization's environment allows it to participate in partnerships, and

3) To allow the effective implementation of the results of partnership, a firm must even practise it sincerely

Moreover, it is important to learn that partnership is not merely restricted to partners who are sure to get influenced by it directly, but it also includes external parties who have interest and concern for the business.

2.9 LITERATURE REVIEW OF THEORETICAL PREMISE

According to Kwan and Ofori, (2001); Liu and Fellows, (2001); Koraltan and Dikbas, (2002) research, it was investigated that an economically plausible basis for partnerships and their presence in the professional services. In particular, the theory predicts that it is the central role of the human capitals that would give a kick to partnership, especially in circumstances where the product quality needs to be determined and when clients are at a disadvantage (Liu and Fellows, 2001; Koraltan and Dikbas, 2002). In Bennett and Baird, (2001); Bayliss *et al.*, (2004); Chan, Chan, Fan *et al.*, (2004) view, these conditions aptly characterize the professional services, that are poorly rendered in organizations that are quite alien to partnership and the right strategy of it.

The researchers Wilson Jr *et al.*, (1995); Brooke and Litwin, (1997); Crane *et al.*, (1997); Cheng and Li,v (2001), have chosen to acknowledge a sober model which would focus on the sourcing procedures in different firms. Love *et al*. (2002: 2) conclude that firms are based on a sound heterogeneous manpower distribution in the market areas. Moreover, Nyström (2005: 473) concludes that it is the caliber of the employees hired that regulate the characteristics of the products of an organization (e.g., Ellison and Miller, 1995; Thompson and Sanders, 1998; Nyström, 2005). Nevertheless, the classic work of Benjamin Ward (1958) proved that the expansion of labor force in partnership firms is comparatively lesser than that in corporations. And the reason behind this is, that profit sharing somewhat restricts the partners to invest beyond the returns they are entitled to (see Cornes, 1996; Cox and Thompson, 1996). Cornes, (1996); Cox and Thompson, (1996) ; Dubois and Gadde, (2002) show that no problems with market

monitoring are preceded by efficient hiring in case of profit maximizing corporation, and a high level of quality in case of partnerships. With less effective market monitor, further, both parties and partnering resort towards reducing qualitativness and sourcing of lesser able manpower with hope to benefit in the process (Brdach and Ecles, 1989; Duboi and Gadde, 2002). Researchers such as (Thomson *et al.*, 1998; Duboi and Gadde, 2002). (West, 1990; Katznbach and Smith, 1993; Albanse, 1994; Igram *et al.*, 1997; Anderson and Wests, 1998; Chowg *et al.*, 2005) simply concludes that better reliability on market monitoring induces corporations to perform better than partnerships and vice versa. In this case, corporations may not hesitate from substituting skilled workers with the less talented ones, for their cheaper market value. Partnerships, however, forever desire to get attention of the highly talented manpower (Johnson and Johnson, 2003). High ability of manpower demand high reservation in salaries. But, sharing in partnering should always be equal which will in turn unveil the willingness of participants degree to which they would desire to engage in profit sharing equal sharing (Pintu and Pintu, 1990; Albanse, 1994; Drewt and Coulon-Thomas, 1996) explains that completion is the labor market is result in adoption for more production based compensatory alliance. Apart from the cross-sectional prediction in which partnering is considered to be the most common in service professionally. Lampan and Dimeo, (1989); Pinto and Pinto, (1991); Todryk, (1991); Katzenbach and Smith, (1994); Albanese, (1995); Fleming and Koppelman, (1997) display measures for feature which are common to partnering like up-or-out promotion systems and non-compete clauses gather to becoming an important aspect in partnering quality mechanism.

Petigrew, (1998); Gaeertner and Dovidio, (2000) further takes into consideration of ways in which the capital requirements or wealthy limits of expected partners may side by an organization . Eventually, Gaeertner and Dovidio, (certain ternds recently 2000) relate the model to some recent trends abord with the partnership in traintional setup. In order to achieve, Gaeertner *et al.*, (1993); Gaeertner and Dovidio, (2000) collaborated intuition in the base model for the analysis in manpower area. Although theories which speak literalitydoes not invite any towards partnership do not offer a commonly accepted reason for why partnerships. Commencing with some noted work done by Alchians and Demset (1972), most of their study have always had a focal point

towards the aspects of incentives for sharing of profit and the role in production measurement for determination in the organization. Alchians and Demset, mention that though it would be easier in management of team activity still the team activity may have significant influence on the results derived (p.786). Gaertneer *et al.*, (1993); Gaertneer and Dovidio, (2000) cite that similar profesiona would be lesser organized to be traditional capitalist firms. In a wide rage of study towards the pattern concerning the ownership, Hansman (1996) encourages that in services , when manpower might be or could be monitored closely when ownership is part of his/ her norms (p. 73). Hansman further suggests that " other factors should be considered which hold much importance to determine the manpower distribution in ownership among the employees there must be other factors that are much more important in determining the distribution of employee ownership, since the types of firms in which employee"(p. 741).

(Nicolini, 2002), theoretically, evacuate from the words from study with emphasis on the influence in sharing of profit for the selection of manpower rather than measuring their motivational aspects. The concept of partnering would normally permit information which are not quite perfect, but the lack of advantage is of the problem in monitoring area, which is among the organization and the partnering clients(sees also Moley *et al.*, 1991; Cowans *et al.*, 1992; Moor *et al.*, 1992). It definitely does not imply of the problems related to the incentives which may be more effective in the scheme related to the financial aspects instead of sharing of profits equally (see for instance Holmstrum, 1982). Rather, Helard, (1995); Schultzelz and Uruh, (1996); Thoms and Thoms, (2005) priority in sourcing the talent in employe may be consistent of the view that compensation in the financial front is just an aspect towards motivation . The partnering model that Gaertner *et al*.'s (1993), constructed would be connected to a enormous amount of literature on firms which primarily manage the labor force. The same literature that constitutes on ward's research narrows down its major focal points in the industrial cooperatives instead of professionalism in partnering with firms which should be expected to react differently towards intake of changes in price or any other schoking news. Usually, the problem of why an organization would be selected when compared to the another one is considered. A point noted by Miyazaki (1984), that the discussion on firms which are driven by labor as significant aspect

result in better performance of protecting employees. For their employees is their main driving force after all. Resulting, organizations might focus towards management of labor when faced with short-run financial difficulties, but switch over to corporation in the long run (Gaertner *et al.*, 1993; Pettigrew, 1998).The challenge when application of the above mention to the professional front is the fact that most of the existing partnerships started off as partnerships instead of converting into one at the time (Hack *et al.*, 2004; Rowlinso *et al.*, 2006),.

It could be argued that significant number of individuals may just desire to work in a partnering environment. But owing to the less availability of firms that manage and supply labor force (the Washigton states plywood firms studied by Pencaveli and Craeg, 1993, are a rare exception), The partnering model estimates that wages which are outside may not be conscious to a representative's acumen (Halmaan and Braks, 1999; Barlows, 2000). Competition of workers makes it obvious to presume that more talented employees will command higher outside wages (Halmaan and Bras, 1999; Barlows, 2000; Naoumn, 2003). Hauc *et al.*, (2004); Rowlinso *et al.*, (2006), acknowledging the excellent policy for hiring and choosing forms in organization inorder to involve the workforce who has growth in wage would directly be proportional to the increase in ability. While Liu and Fellows, (2008) main conclusions do not change, there are however some new insights that have been gained. For precedent, an organization may not recruit the appropriate manpower, but it may consider the workforce who has significant gap between marginal product and outside wage is largest. The important observation here is that the way in which the workforce completion would impact partnering is very distinct from the way it would affect organizations (Lockey and Lathm, 1990; Katznbach and Smiths, 1993; Leu and Fellow, 2001). Ususlly the organization would be allured towards procurement of cheap quality manpower irrespective to their abilities. Nonetheless, often the main problem faced in the state of partnering the manpower which has high work ability may be unwilling to share profits earned with manpower who has low ability (e.g., CII, 1992; Binnett and Jaye, 1995; Lonard *et al.*, 1996; Chang, Chang, Fen *et al.*, 2004). At the outset, Liu and Fellows, (2001) cited about the partnering concept which has been the classical mode in an organization for services in the professional front. The model of partnership elaborates with help of demonstration that the amalgamation of

qualitative uncertainty as per the clients and their relation with human capital and quality, are two basic aspects for making any partnership desirable. (e.g., Cooks and Hancher, 1990; Larsons and Drexler, 1997; Conleey and Gregory, 1999; Blaick *et al.*, 2000; Chenug *et al.*, 2000; Gllagola and Sheedys, 2002; Nig *et al.*, 2002; Chang, Chang, Chang *et al.*, 2004; Fishers, 2004), alignment (Barlow *et al.*, 1997; Halman and Braks, 1999; Barlow, 2000; Hauck *et al.*, 2004; Rowlinson *et al.*, 2006)

Summary of the theoretical premise literature review – Various researches have highlighted the appearance of partnership concept for mechanism in team building and as a impetus towards change in cultural setup (e.g., Mosley et al., 1991; Moore et al., 1992; Abudayyeh, 1994; Albanese, 1994; Brown, 1994; Wilson Jr et al., 1995; Miles, 1996; Gardiner and Simmons, 1998; Winch, 2000; Nicolini, 2002; Beach et al., 2005). The observed gap from the review is 'Though the partnership theory has attempted to understand the mechanism of partnering with primary and secondary stakeholder from the regulatory point of view, there is a need to study the mechanism for partnering with non-stakeholders such as society in a mutual benefit scenario'.

Figure 2.3: Alignment of identified research gap with theoretical premise

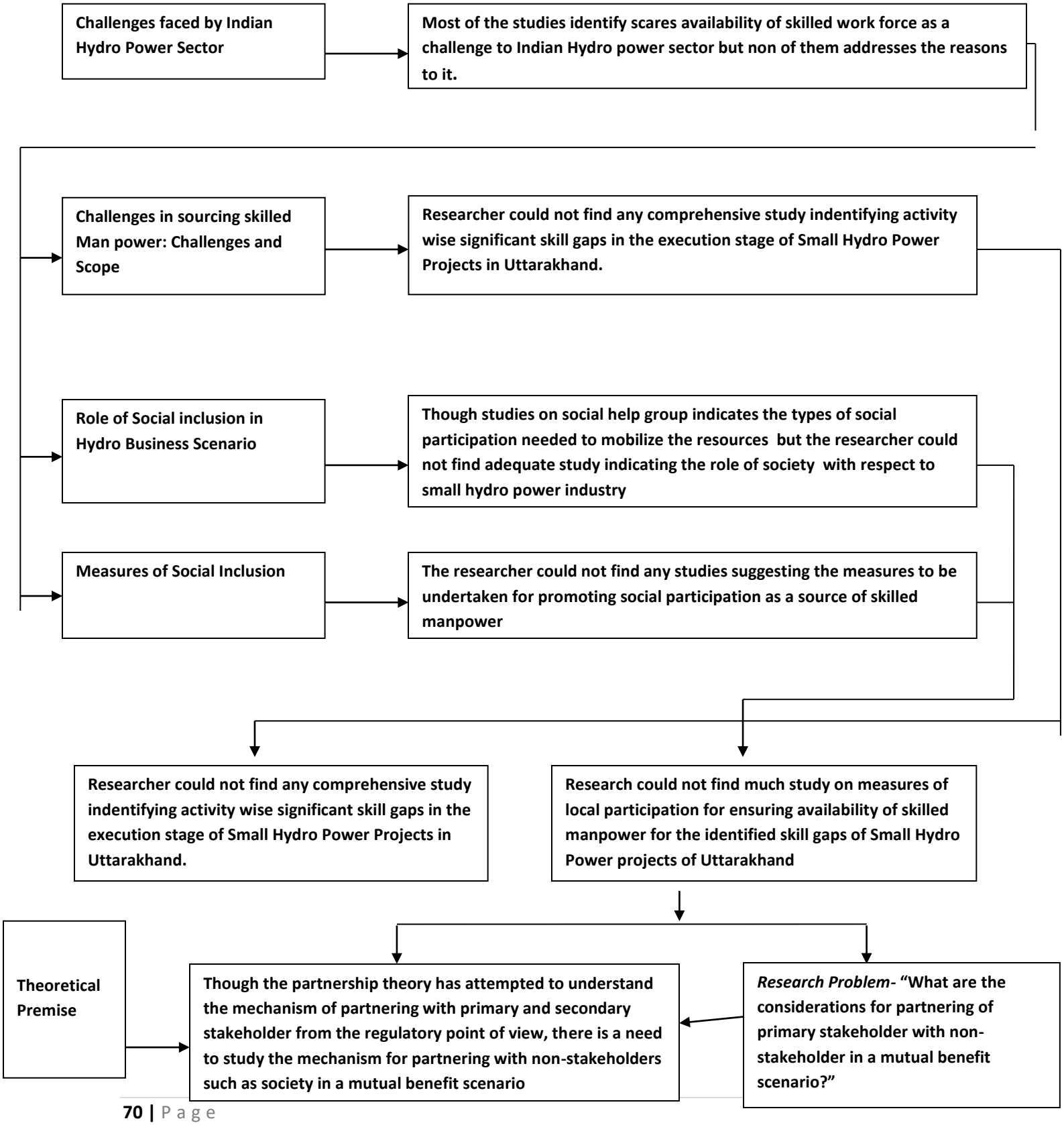


Figure 2.3, illustrates the alignment of identified research gaps with the theoretical premise. The figure depicts the logical flow of gap identification at each stage of review in a step by step process and identification of gap from theoretical premise. Together the complete process is directing towards the research problem, also identified through the literature review process.

2.10 SUMMARY OF CHAPTER

After the identification of the Business Problem in Chapter 1, this Chapter on literature review would give a basic and brief overview various literatures available of other researchers available on the topic of study. Wherein Measures to promote local participation for sourcing of skilled manpower in Small Hydro Power Projects in Uttarakhand have been explained elaborately. Moreover, an attempt have been tried in the chapter to elaborate over various challenges faced by Indian hydro power sector on a sustainable energy path at present and linkage of identification of challenges and measures to the identified challenges for solving the discern Business Problem. Following the literature review, significant gaps were noticed and furthermore the process of gap identification and its alignment was explained via tabular illustration. Subsequently, brief overview on Theories and Models of strategic ways to source manpower, Constructs of sourcing manpower in small hydro business scenario of India has been narrated in this Chapter.

The above figure 2.3, illustrates the Theoretical gap being 'Though the theory of partnership has attempted to understand the mechanism of partnering with primary and secondary stakeholder from the regulatory point of view, there is a need to study the consideration for partnering with non-stakeholders such as society on the basis of mutual benefit', the research problem of the study may be stated as **"What are the considerations for partnering of primary stakeholder with non-stakeholder in a mutual benefit scenario"**

CHAPTER 3 – RESEARCH METHODOLOGY

3.0 INTRODUCTION

In this chapter the design and methodology for conducting research study. The design of the research describes a federation among the observed data with the questions of research because of which the basis of research has been initially been required to do and finalizing the conclusions (Yin, 2003). In particular the various paradigms which are scientific in nature , research methods , strategies and technique to accumulate the data is discussed. The chapter follows a logical approach to describe the questions of research, the focus for conducting research, objectives and way to inquiry in research will be elaborated.

3.1 PROBLEM STATEMENT

The various investigated reports illustrate that "Inadequate availability of skilled manpower at the execution stage is leading to Cost over run and Time over run in Small hydro sector projects in the state of Uttarakhand " . Furthermore, the extensive literature review confirms the inadequate availability of skilled manpower at the execution stage is scarce, thus forming an alignment with the reports investigated by experts in the industry.

3.2 RESEARCH QUESTION

Firstly, the question's nature is been described as descriptive and it explores towards addressing of and finding the activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand. Further, it seeks to list down the significant skill sets required in the execution stage of Small Hydro Power Projects in Uttrakhand

RQ 1 - What are the activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand?

Secondly, the question we further seek to address is exploratory in nature. It aspires to find out the various measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand. Hence, it requires to develop an understanding of the aspects of social sciences.

RQ 2 **-**What are the measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand?

3.3 OBJECTIVES OF THE STUDY

In the research process, researcher defines the problem in practice. Then the researcher explores and understands the nature of problem completely through a systematic study (Maxwell, 1996).The research questions and research design are developed so methodically to understand the problem of the study, thus formulating the specific objective of the study.

1. To identify activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand.
2. To find out measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand.

3.4 RESEARCH DESIGN

As explained by Creswell and Plano Clark (2008) a research design is a 'conduct to collection of data, analysis, and interpretation and making reports of the collected data' for research study. The two designs i.e., descriptive and exploration research has been selected as per the demand of the study. The research which is exploratory in nature would administer acumen into and discern of the issue or the situations.

Exploratory research helps to determine the best research design, data collection method and selection of subjects. While **descriptive research**, also known as statistical research, describes

data and characteristics about the population or phenomenon being studied. Descriptive research answers the questions *who*, *what*, *where*, *when* and *how*. Thus, on the basis of the above, the two research designs were appropriate for the present study as it was important to gauge the various project specific risks that impact the software projects and also understand the dynamics of organization's climate on these software projects.

For effective and flawless data collection, survey, interview and case study methods were extensively used. Survey method is the most extensively used technique for data collection, especially in behavioral sciences [198], while interviews are an appropriate method to use when exploring practitioners perspectives due to the qualitative nature of the information [199]. Case study methods are used for an in-depth investigation of a single individual, group, or an event. It provides a systematic way of looking at events, collecting data, analyzing information, and reporting the results [200]. Thus, these methods have been widely used to extract the most relevant information and help in better analysis of the data.

By including both quantitative and qualitative data, case study helps explain both the process and outcome of a phenomenon through complete observation, reconstruction and analysis of the cases under investigation (Tellis, 1997). Case studies were one of the first types of research to be used in the field of qualitative methodology. Much of what we know today about the empirical world has been produced by case study research, and many of the most treasured classics in each discipline are case studies2 (Flyvbjerg 2011, p. 302).

3.5 MIXED METHODS RESEARCH

Mixed methods research is a type of research in which, within a single study, or more researchers use *both* qualitative and quantitative methods and, by extension, these methods' respective paradigm perspectives. The purpose of using both methods is to produce a "better understanding" of a social phenomenon. This understanding is produced by combining quantitative and qualitative research for the mixed methods purposes of triangulation, complementarily,

development, initiation, or expansion. The use of qualitative and quantitative methods within a study is guided by a mixed methods way of thinking (Greene, 2007), which is a mixed methods paradigmatic approach that invites multiple ways of knowing into a single study. These ways of knowing are represented by qualitative and quantitative research and their associated paradigm characteristics of the researchers. A mixed methods way of thinking emphasizes a respectful dialogue between different perspectives, understanding that each offers only a partial understanding of the social world. Within this framework, qualitative and quantitative methods, paradigm characteristics are mixed in a dialogic, iterative, and interactive manner. The orientation of mixed methods research emerges from both the paradigm and the need to address specific research questions. This approach to mixed methods research privileges the equality of different perspectives by mixing, or integrating, qualitative and quantitative methods and perspectives throughout the research process. This interactive and dialogic mixing of methods and perspectives must be done not only to engage in dialogic thinking but also to ensure the study appropriately addresses its research questions.

3.6 PARADIGMS & MIXED METHODS RESEARCH

The field has yet to come to a consensus about what will inform the paradigmatic foundations of mixed methods research (Teddlie & Tashakkori, 2003). Currently, the role of paradigms in mixed methods research may be categorized into six different positions:

The purist, complementary strengths, a-paradigmatic, substantive theory, dialectic, and alternative paradigm (Caracelli & Greene, 1997; Greene, 2007; Teddlie & Tashakkori, 2003). While all six of these represent unique perspectives about the role of paradigms in mixed methods research, the following section focuses on the dialectic position because: this paradigm position contends more comprehensive understandings of social phenomenon emerge when mixed methods researchers place equal importance on both qualitative and quantitative research approaches, and this paradigm position is closely related to the paradigmatic approach of this exemplar study – a mixed methods way of thinking.

3.7 LOGIC FOR MIXED RESEARCH

The study aims in researching two basic objectives. The first objective of the study is quantitative in nature and hence requires statistical analysis. The second objective of the study is qualitative in nature, for which case study method was considered to be most appropriate way. Hence, the study and the objectives of research itself indicated towards using mixed method research (Johnson et al., 2007).

3.8 DETAILED RESEARCH DESIGN & METHODOLOGY – RESEARCH OBJECTIVE-1

3.8.1 Research Objectives 1 – To Identify activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand.

3.8.2 Research Design – Quantitative (explained in detail below)

3.8.3 Nature of Research Questions

For the research in quantitative areas, a measurable data set in first most requisite. Collection of data and analyzing the data with an interaction to validate the assumed factors which has been illustrated in the study is described elaborately. When a quantitative research is conducted, in quantities methods some statistic test are also performed. The outcomes of this statistic test are further utilized for inferring assumptions developed by the research. As the assumptions made are more generic in nature, hence the assumptions are also generic in perspective.

3.8.4 Sampling Technique – Judgmental (explained in detail below)

3.8.5 Sampling frame – 48 variables

The respondents who had stake in small hydro power in Uttrakhand had been identified to be part of sample frame. The above mentioned respondents may or may not be correlated directly or indirectly with the involvement of small hydro power in Uttrakhand. These identified stakeholders include employees of Uttrakhand Jal Vidyut Nigam Ltd. Further in detailed description of stakeholders is given in table 3.1.

Designation	No. of employees
AO	50
AAO	75
JE	145
EE	121
AE	78
Control Room	12
DGM	2
DM	2
GM	1
SO	67

TA	47
Total	600

Table 3.1: Description of stakeholders

3.8.6 Sampling Design

In order to collect data from the field area use of Quota sampling design was made. It basically is a non-probability sampling design. In this sort of sampling designs, quota usually are set in accordance with certain specific characteristic and further investigated to select some unit within this sort of quota. As the mentioned quota the items that are samples would depend upon the judgments of a personal or convenience of the same. In case of this study initially the population was categorized into different designations (table 3.1) and then from each category 423 respondents responded the questionnaire as per their convenience.

3.8.7 Study Location /Target Population and Sample Size

The target population for survey includes employees in the organization – 'Jal Vidyut Nigam Ltd associated with small hydro power energy sector in Uttrakhand. The focus was on to understand that at the time of execution of the project construction what are the activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand.

Sample sizes was calculated based on Yamane (1967:886) and is shown below in table 3.2. Yamane (1967:886) delivers a simplified formula the confidence level at 95% with P = .5 can be simulated for the Equation. Here 'n' would represent the sample size, 'N' would be the size of the population, and finally 'e' would represent the level of precision. On application of the mentioned formula, the study would acquire the sample size which is required. Calculation of the sample size

would was calculated on the basis of Yamane's Formula (Yamane, 1967) (Israel, November 1992)

$$\text{i.e., } n = \frac{N}{1+N\,(e)\,2}$$

Where,

n = Sample size

N = Size of population

e = the error of 5 percentage points

Table 3.2: Detailed sample calculation of each location (Yamane's, 1967)

1. **Study Location – Dehradun, Uttarakhand**	2. **Study Location – Haridwar , Uttarakhand**	3. **Study Location – Uttarkashi , Uttarakhand**
n =? N = 397 e = .05 n = 397_____ 1+397(0.05)2 n = 199 Sample collected = 267	n =? N = 60 e = .05 n = 60_____ 1+60(0.05)2 n = 52 Sample collected = 50	n =? N = 106 e = .05 n = 106_____ 1+106(0.05)2 n = 83 Sample collected = 94
4. Study Location – Rishikesh , Uttarakhand	**5. Study Location – Rudraprayag, Uttarakhand**	**6. Study Location – Joshimath, Uttarakhand**
n =? N = 25 e = .05 n = 25_____ 1+25(0.05)2 n = 23 Sample collected = 24	n =? N = 15 e = .05 n = 15_____ 1+15(0.05)2 n = 14 Sample collected = 5	n =? N = 10 e = .05 n = 10_____ 1+10(0.05)2 n = 9 Sample collected = 8

Overall 600 folks were diagnosed to be the population which would serve as the study's target population. So that the survey could be smoothly carried out. The respondents among the population s who are in association with Uttrakhand Jal Vidyut Nigam Ltd. On applying Yamane's formula researcher arrived at the sample size of 600 where N = 600 and e= 0.05. A 100% population has been inferred to be the respondents in the study.

Table 3.3: Study Location

Study Location – Uttarakhand		
S.NO.	**Location**	**No. of respondents**
1.	Dehradun	267
2.	Haridwar	50
3.	Uttarkashi	94
4.	Rishikesh	24
5.	Rudraprayag	5
6.	Joshimath	8

The table 3.3 above illustrates the final number of respondents from each location, calculated on the basis of Yamane (1996). Earlier the questionnaire had been sent to 600 respondents with help of email, and contact personally, among which total 450 responses had been received back. It was observed that few of the responses were quite incomplete and hence were removed from the account. Finally, 423 responses were considered for analysis of the data giving a response rate of 70%. As per the generic norms laid by (Hair, Black, Babin, Anderson, & Tatham, 2008; Malhotra & Satyabhushan, 2011) it is important to maintain a particular ratio of response in each variable in order to conduct factor analysis. The minimal criteria was profitably filled so that the study could be conducted with a total of 423 responses on 48 variables.

3.8.8 Method for Data collection - Survey

It s atechnique so that primary data may be collected, and usually it is used in case of quantitative research. It is helpful in collecting bigger sample size and further establish relationship which is statistical in nature. This method would relate with the study that uses funnel down approach in exploratory and descriptive research. Usually it helps in answering queries such as what, where, how much and how many (Saunder, Lews, & Thorhill, 2007).

Hence survey technique is accepted to be most suitable for achieving the first objective of the study i.e. 1. To identify various challenges and barriers those impact thegrowth of small hydro power projects in Uttrakhand.

3.8.9 Questionnaire structure – Survey conducted through the questionnaire method is considered to be a very organized technique within the similar set of questions were questioned to different respondents (Vaus,2002). The Questionnaire would just be a list of questions that a researcher seeks to inquire from the study's identified respondents (Godard & Melville, 2006). The study begins with the intent of inquiring some basic information about the respondents which would be followed by certain set of questions specific with each category of work identified in the study (Appendix 2). The document called the questionnaire was then divided logically into section on the basis of the segmentation in the study. Towards the conclusion of the document, the population who were responding had been asked to give their view in the section that says 'your suggestions'. The table 3.1 illustrates categorization of questionnaire along with details of the question which were inquired as per every category. Every response was collected on a basis of a five point Likert's scale(1 being 'No Gap'; 2 'Less Gap'; 3 'Neutral'; 4 'High Gap'; 5 'Very High Gap') (Vaagias &Wade, 2006). The questions in the questionnaire were tailored on the basis of the level which could be easily understood by the respondent population. The study ensured that the words in questions would be ppresise , concise and clear in every aspect (Bell, 1993). These sections were developed to keep the similar questions together and easier to be understood by the respondents.

A detailed description of categorization of the questionnaire based on the set of tasks performed in a particular process has been described below. Then each type of activities performed in that particular task in described. Questions are asked regarding the significance level of each skill set required to perform in each activity under its task category. Data is then collected from primary stakeholders who are directly involved in execution process i.e.

1. Civil Works Implementer
2. Electro-Mechanical Works Implementer
3. Hydro-Mechanical Works Implementer

(Questionnaire – Civil Works, Electro Mechanical Works, Hydro Mechanical Works are all attached in Appendix)

3.8.10 Categorization of sections in the questionnaire

The objective of this study is to ascertain the human skill gap observed as a barrier to perform each activity efficiently. Hence, as per the requirements of the study the respondents were asked questions, where each activity was defined at the construction site of the small hydro power plant.

Figure 3.1: Categorization of sections in the questionnaire

3.8.11 Information sort

With help of literature review certain variables were identified, these views were collected and collated by researchers based on experiences of personals and then further they were presented to the respondent in a form of questions. The study then requested the respondents to select their answer among from five options (based on a five point Likert scale) for a particular variable depending upon its significance of a particular skill required in each activity at the execution stage of small hydro power projects in Uttrakhand.

3.8.12 Methods of Administration

The modes used in collection of responses were through contact to respondents made on personal basis, through emails and visiting personally. Especially the higher authorities were personally contacted and discussion of the questionnaire was done. Also personal visits were carried out to the stakeholder's office and work places. Many response were collected and with help of email method. The set of questions were emailed to the probable respondents along with some introduction to the researcher and the researcher's background. A vigorous after check was conducted via pone or email to get the questionnaire filled timely. The process of communication with the identified respondents proved to be very effective as it helps the study in increasing the response rate.

3.8.13 Tools for Data analysis

In the process of Factor analysis, it experiments towards discovering of the factors that have been unexplained but also are quite influential over the co-variation within the multiple observations. These identified factors are the representation of the basic approaches which could not be aptly measured with help of a single variable. As the aspiration of the factor analysis has been to explore and bring out the factors which would describe correlations among multiple outcomes. The factors that are to be observed must be somewhere correlated to each other in some way or

another. Critical Factors were extracted for each category using a principal component factor analysis, employing Varimax factor rotation with the help of SPSS 21 software. Factor Analysis has been explained in detail in the next chapter.

3.8.14 Research Quality

The process that is scientific in nature and is encompassing most of the aspects in the case study design if often referred to as research quality; particularly, it applies to the acumen respecting the similarities among the question and method, subject section, measurement of results and guarding against the biasness which may be systematic or non systematic and also error which is inferential (Boasz & Ashby, 2003; Loher, 2004; Shavlson & Towne, 2002). The quality in the research serves as the outrider of the statements and paragraphs about the evidences, standards that are consensus in nature over the quality of the research and constant reporting (CIHR;2004; Daves et al., 2003).

3.8.15 Convergent validity

In case of scores which are obtained by two varied instruments which measures the similar concept is referd to as construct validity. The variance which is explained must be greater than 0.5 in order to suggest appropriate convergent validity (Hair, Black, Babin, Anderson, & Tatham, 2008). Detailed explanation is given in chapter 4.

3.8.16 Discriminant Validity

When two variables are assumed to be unrelated with each other and on the basis of the theory, the score which are obtained by each of them are spherically found in accordance to the assumed phenomena then such situation it is termed as Discriminant Validity. In a simpiler form, it can be easily distinguished among the constructs which are not similar with each other. For the purpose of, Discriminant validity, cross loading of factors must be in place (Hair, Black, Babin, Anderson,

& Tatham, 2008). It has been observed that no sign of cross loading in factors has contributed to the rotated component matrix. The aim of this type of research would be so that the qualitative and quantitative research, when combined would provide a holistic view point in the research problem. The second objective of the study is exploratory in nature and hence, suggests a different approach from the above explained methodology.

3.9 DETAILED RESEARCH DESIGN & METHODOLOGY –RESEARCH OBJECTIVE 2

3.9.1 Research Objectives2- To find out types and measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand.

3.9.2 Qualitative Study

On identification of the important skills gap, the identified variables were listed as they were the leading challenges in the study, hence the study forwarded in to the field to collect data by conducting interviews with identified stakeholders (in Case 1- Madyamaheshwar and Case 2- Kaliganga II. The following section explains case study method, case study design, data collection method and case analysis method.

3.9.3 Case Study Research

Robson (2002) defines a case study as "A strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence" Method of case study is often preferred when the study attempts to inquire the questions related to 'how' or 'why'. Also in case when there is little or no control of events by the study or the researcher then focus would be on = contemporary phenomenon within real-life context (Yin, 2003)

3.9.4 Case Study Design

As per the research design of a case study, the discussion emphasizes on the list of cases, the criteria of selection of cases, and the units of analysis (Yin, 2003). The two important aspects of case study design are (i) Case study protocol (ii) Data collection process.

The protocol of case study enlists certain procedures along with instruments under rules laid down which must be followed for using of the instrument. Further for addition of reliability to be increased in case study the protocol energizes the researcher on the case study and gives its overview and further aids the research to conduct the research (Yin, 2003). The major components of a case study are basically three in number: (i) fretures which are key construct in the method (ii) structure of the protocol (iii) aim of conducting the case study. The organization of the protocol outlines the procedures of how to carry out the field visits, design case study questions and the analysis plan .

3.9.5 Unit of Analysis

Case study research focused on a State Uttrakhand (Case 1- Madyamaheswar and Case 2- Kaliganga II) as a single holistic unit of analysis.

3.9.6 Number of Cases

For selecting a case study method, it is important to first determine which case design would the study select, either a single case design or a multiple case design.The signgle case design is helpful when a critical case needs to be presented for testing of a theory which has already been formulated. (Yin, 2003). But it does not apply to the study at present. Therefore, based on the study, the research questions and the objectives the research was directing towards the use of multiple case design method. (Case 1- Madyamaheshwar and Case 2- Kaliganga II). As per multiple case study, both the cases serve the specific aim within the overall scope of inquiry (Yin, 2003).The choice of multiple case would follow ‘ replication’ logic so that the study may be

able to decipher the similarities and dissimilarities of the cases (Yin, 2003). This logic of replication would help to present and explain the compared result. =Moreover the replication logic helps to increase the external validity of research (Eisenhardt, 1989; Yin, 2003).

3.9.7 Selection of Cases

The selection of cases was based on the total generation capacity according to its potential. The maximum generation capacity of Case 1- Madyamaheswar is 15 MW in district Rudrprayag and Case 2- Kaliganga II is 4.5 MW in district Rudrprayag. Being the highest upcoming potential generating capacity small hydro power plants in the state Uttrakhand, there is very high possibility of ensuring higher local participation and scope for larger participation in the study. The final selection of the two cases was made on practical considerations to find the barriers and scope of local participation.

Case Study 1: Madyamaheswar (15 MW in district Rudrprayag)

Case Study 2: Kaliganga II (4.5 MW in district Rudrprayag)

3.9.8 Data Collection Method

In a case study research evidence must be gathered in various forms such as, records, questionnaire responses, interview, observation and artifacts (Eisenhardt, 1989; Yin, 2003) . The process of triangulation increases the validity of a case study, by collecting the data from many sources which further allows in depth analysis of the study with multiple view points. The data collection gives significant information of who, how and why, as these information were documented into knowledge, experience, opinions, and feelings of the interviewees. Data coding and analysis was performed with audios recorded and transcription of interviews was done with help of a software called Atlast ti 7.0 version, it is a software popularly used for qualitative analysis. In accordance with the code schemes, the texts noted during the interview were coded.

Pteh process by which codes were created, and linking of codes was done, the process proved to be very rigorous and repetitive in nature. To interpret the results, the study followed a three step approach. First, the data among the text was selected and presented in a qualitative format. Second, within case analysis approach was followed. Third was cross case analysis in the study. Data was collected from July 2016 to December 2016 time period. The prospective respondents were contacted with help of telephone, emails, and visitation to the plant site personally. When the respondents were contacted personally, then a brief discussion was made about the study and the researcher along with factors affecting the local participation as a measure to fill the skill gap at the small hydro power plant location site. It is often difficult for people to find out time out of their daily routine work, so considering all the possibilities the arrangements were made with participants willing to participate as per their convenience and availability. The researcher requested to meet the participants at their preferred place as per their convenience. Prior to making appointment for personal meeting, a appointment was confirmed via telephone, as it is should be easy and convenient for the interviewer and interviewee to be prepared as per mutual convenience. The conversation for collecting of data mostly took place in the respondent's office place. For the purpose of study, Researcher was lucky to spend quality time and have interaction with Plant manager and site engineers to gain ground level experience on plant constructions/execution stage and employee performance to manage the barriers of skill gaps. The visit also helped the study to gain insight on the experiences of employees, during construction phase of the plant. Further, the study accessed documents such as, gazette orders by the regulators of state and central government, policy documents, reports by various organizations etc.

3.9.9 Triangulation

As per Tashakkori and Teddlie (2003) the triangulation is describes as 'when the mixed method is used in research ; the combination of quantitative and qualitative work, the combination and comparison of the various data collected from multiple sources; the analysis of outcomes from both methods and then inference of the combined outcome' is called the process of triangulation. It is conducted because, the study uses various methods for collecting the data; and that collected

data gives the study various perspectives to look at it. Hence, by this method it would be easier to produce the strengths and weakness of the overall research (Denscombe, 2003). As mentioned in the previous section data was collected through interviews, documents and observations which resulted in fulfilling the criteria for Triangulation.

3.9.10 Interviews

Interview was conducted from July 2016 to December 2016, where participants were questioned for over a period of six months time. As per the interview guide baseline, the questions were kept semi-structured and were also open ended. Two strategies were utilized for interviewing; firstly, as per the interview guide approach as suggested by Patton (2002). Secondly, interview based on informal questions, when informal conversation is ongoing then questions might arise immediately from the context and asked in natural course of things' (Patton 2002). The interviews which are semi-structured. To increase the reliability and validity of the research and also reduce biasness, the study decided to utilize the Semi structured interviews (Eisenhardt, 1989; Yin, 2003). The interviews were recorded and transcribed in accordance with confirmation of participants interviewed, along with follow-up questions.

3.9.11 Documents

The study primarily aimed towards the review of document so as to understand the situation of plant site scenario in Madyamaheswar, 15MW (Rudrprayag) and Kaliganga II, 4.5 MW (Rudrprayag). To gather necessary information, researcher extensively reviewed all documents with regards to the skills required in each construction activity of the small hydro power plant. Documents for review comprised many types of documents such as small hydro power projects HR policies, Recruitment Policies, Ways and Methods by which required skilled personal is recruited for a particular job, policies regarding social inclusion in Uttrakhand Jal vidyut Nigam Ltd, sector development reports, national and federal regulation regarding recruitments in hydro

power sector and specifically in small hydro power sector, reports by national skill development council.

3.9.12 Coding

Before the study discusses any meaning of the gathered information, a process is followed to organize the collected information into chunks & segmation of text is done, this process together is called coding (Rossman & Rallis, 1998). In the process, the collected data is divided into categories, such as it may be in form of interview, or in form of a document or even images or text; then these divided categories are labeled with some words which are called as 'Codes'. These codes are a resemblances of words which is part of the actual language (Creswell, 2009). In the context of the current study, recorded interview were used for coding with the help of Atlas ti 7.1 software. The software Atlas ti, helped in facilitating the process of analysis and helped for doing the coding process, it helped in further linking of coded with each other; memos were created as well. The software is quite very helpful for the purpose of making searches, organizing and editing and displays the data is a very appropriate manner (Miles & Huberman, 1994; Weitzman & Miles, 1995; Creswell, 2009). The figure 3.2 shows an example of coding from the current study.

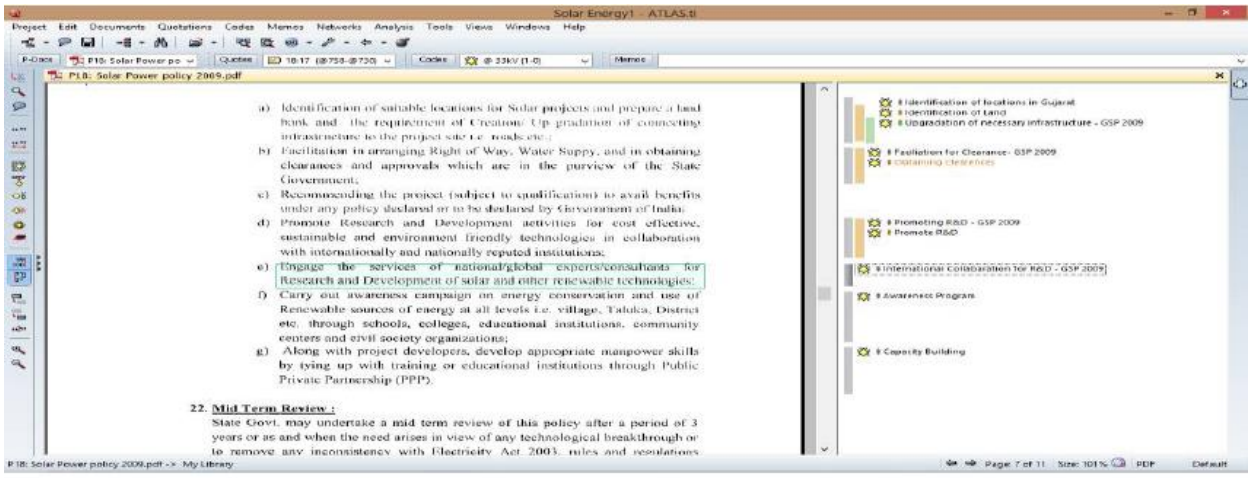


Figure 3.2: Example of Coding

3.9.13 Case Analysis Methods

In order to provide a holistic view of the two cases, the study has decided to conduct both within case analysis and cross case analysis. It is a combine method in which the approach would help in counteracting information and present the study with most accurate and valid conclusion. (Eisenhardt, 1989).

3.9.14 Within-case analysis

Within case analysis if performed for giving detailed account on each plant location to formulate case study. By using this method, the study helps in management of voluminous data which was collected during the data collection stage (Eisenhardt, 1989). When within case analysis is performed, it involves in depth study of the particular case, this deep study aids in getting familiarized with the selected cases, according to the study being, Case 1 Madyamaheswar, 15MW (Rudrprayag) and Case 2 Kaliganga-II, 4.5MW (Rudrprayag). During the study, all the data collected in the form of semi structured interview, as well as the noted which were hand written during the interview were organized and recorded logically. The transcripts that were prepared and also the secondary data collected were considered to the source of case study hence discussion was made on this basis. Analysis of all the collected data was done through the process called coding. There were several interviews conducted from each case and a comparison across different respondents from the same case was carried out, which helped the researcher to better understand the response of the Case 1 Madyamaheswar, 15MW (Rudrprayag) and Case 2 Kaliganga-II, 4.5MW (Rudrprayag) to identify barriers and scope for social inclusion of local population towards our objective - To find out measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand. Process facilitated the researcher to develop the strong base for the cross case analysis.

3.9.15 Cross Case analysis

Eisenhardt, 1989 has defined the cross case analysis as “a selection of pair in case and then further list to be made to draw the similar and dissimilar factors in the selected case” . During the study, on review of each case with its individual perspective, the study then moves further to draw the second phase in analysis which is cross case analysis. In cross case analysis, comparission of both cases is drawn upon.

3.9.16 Research Quality

The reliability and validity are two basic characteristics for evaluating the quality in the case study research. The features in validity include, the construct of validity, internal and external validity. As the study currently is a mix of qualitative and quantitative method, it is not seeking for investigation in casual relationship and internal validity (Gibbert, Ruigrok, & Wicki, 2008) as it was not observed to be of any relevance for discussions. Further, the sections below will describe on the ways by which the construct and external validity was derived for the study.

3.9.17 Construct validity

As per Yin (2003) aconstruct validity is an appropriate operational measure to the the concepts in the study. This would imply that construct validity must be taken into consideration for the study during collection of data and also during the composition phase (Yin, 2003). The construct validity was performed after the triangulation of study was established, as it required combination of various sources of data for the purpose of establishing evidence of the same to give a holistic view of the study. By collecting data from many sources, the process will eventually contribute towards formation of “multiple measures of the same phenomenon’ (Yin, 2003). The collection of data was done through many source, including conducting the interviews, reviewing of documents and policies laid by government and organization dealing in small hydro power business, also through visiting personally to Madyamaheswar and Kaliganga-II. All the pieces of

information which were collected via various modes was then transcribed and data analysis was done, in order to enhance the construct validity by providing multiple perspectives of phenomena

3.9.18 External Validity

External validity, also called as the process of generalization. As suggested by Yin (2003) I the study should generalize its findings and discussions which should be beyond the context of the case taken in the study. For the design of multiple case study and cross case analysis, it was considered as per the logic of replication. Logic of replication is similar to the experimentation in which generalization may de considered from one particular case experiment to another one (Yin, 2003).

3.9.19 Reliability

As per Yin (2003), reliability is described as the demonstration of the study, data collected may repetitive to the similar results. The purpose of performing reliability is so that the biasness and any error in the result may be minimized. As per the study currently, consistency was ensured for collection of data and analysis. For guiding the research in case study, the use of case study protocol was made (Weitzman & Miles, 1995; Yin, 2003).

3.9.20 Case Study Protocol (Purpose)

A document which contains the questionnaire so that data may be collected also the a set of guidelines and rules must be followed in case of case study protocol. The objective of the protocol is making use of the case study method as a strategy for conducting research in order to get an in depth analysis of the objective of ascertaining the human resource requirement at selected cases.

3.10 SUMMARY

This chapter has outlined the theoretical framework for the study, pragmatism, and discussed, why it is particularly suited to this study. The chapter also discussed the importance of mixed methods sequential explanatory design and how it best suits the current study under consideration. The quantitative and qualitative methods used in the study have been explored and explained, with detail given to choice of method logy with consideration to attain overall research quality. Further the chapter informs the sample size and study population in relation to the current study. The data collection method for quantitative and qualitative methods was discussed. Data analysis, including quantitative, qualitative, and integration of data, has been described and discussed with reference to its importance in a mixed method design. The discussions on methodology used for the study, this chapter discusses ways to identify the various factors that act as barrier and scope of local social inclusion as a measure to fill the skill gap requirement at construction/ execution stage of small hydro power plant in Uttrakand. This completes the discussion on the research methodology adopted for the study as well as the fulfillment of study objectives. The next chapter depicts the Data Analysis for the study's objectives.

CHAPTER 4- DATA ANALYSIS FOR OBJECTIVE 1

4.0 INTRODUCTION

In this chapter we have discussed the analysis and findings of the collected data. Since, the study desires ascertaining the skill gap requirements in each activity performed at the construction site of the small hydro power plant, detailed account has been considered and the extensive process of how the data was collected has been described per step. This further has been analyzed through Factor Analysis technique using SPSS 21. Results and findings are enclosed towards the end of each representation.

4.1FACTOR ANALYSIS (OVERVIEW)

Factor analysis usually constitutes of a technique which is statistical in nature and with its help the study observes a relative smaller number of dimensions also called as factors that may be utilized for representation of relation between the variables which are related to each other. The attention is drawn upon to identify the 'factors' that may analyze the various amplitude involved with the variability of data. Factor analysis has extensively been used in form of analytical techniques for data in the 21st century. Though much usage in this sort of exploratory research in the social science domain, but have been observed while examination of patterns in interrelationships, data reduction, instrument development, classification and description of data, data transformation, exploring relationships in new domains of interest, and mapping construct space. A geometric presentation which would allow for visual display in behavioral relationships.

4.2 APPLICATION IN FACTOR ANALYSIS

Two applications primarily have been observed in Factor Analysis. Which are (i) in reducing the list of variables (ii) For detection in structural relation among the variables

4.3 FACTOR ANALYSIS – TYPES

The two major kinds of Factor Analysis are:

1. Principal component analysis – the principal component analysis is a technique to give an exclusive explination, so as to reconstruct the original data from the outcomes. From among the variables, the total variance is critically examined for generation of many factors as variables

A run of 48 observed variable was done using SPSS 21 version (software for statistical analysis) in factor analysis, the first result set is derived. The derived result may have the similar numbers of factor as much as the variable that were in serted for the process. Based on the results, the Variance also called as the Eigen value would aid in deciding the number of factors to be extracted.

2. Common factor analysis –It is commonly perceived by everyone when the term factor analysis comes to mind. Common factor analysis would be a clan of methods which are used in estimation of common variance within the variables which were origionally considered. Hence, selecting the count of factors for taking of analysis further would be more difficult by using the common factor analysis method instead of principal analysis method. This will help in recognizing the number of variables that are correlated.

4.4 PREPARATION OF DATA FOR FACTOR ANALYSIS

The data is created in a specific format and it should posses some attributes so as to serve as an input for conducting factor analysis. They are: (i) The variables which are regarded to be un-related to each other in various ways should not be included. (ii) Three variables must be observed as a minimum requirement for the analysis to be performed. (iii) For generating valid results, more the number of variables , better it would be for generating a reliable assessment in the correlation of the variables. However, the more the observations, the more valid the results.

4.5 ANALYSIS

Our objective is “To identify activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand.”

In order to achieve our objective we first made a list to understand what are each activities that are done on a construction site of the small hydro power plant? We can see in figure 4.1below

Figure 4.1: Example, activity wise list at construction site of small hydro power plant

ID	Task Name	Duration	Start	Finish	Predecessors	R
1	Mobilization	47 days?	Thu 01-10-15	Fri 04-12-15		
2	**Head works**	**1199 days?**	**Mon 12-01-15**	**Tue 13-08-19**		
3	**Construction of Wier (121 m)**	**736 days?**	**Mon 12-01-15**	**Mon 06-11-17**		
4	**Phase-I**	**160 days?**	**Tue 01-12-15**	**Mon 11-07-16**		
5	River diversion	14 days?	Tue 01-12-15	Mon 14-12-15	1	
6	Slip clearance (23500(Weir)+2600(FT))=32830)	21 days	Tue 01-12-15	Mon 21-12-15	1	
7	Excavation between ch. o to 15 m length	4 days	Tue 22-12-15	Fri 25-12-15	6	
8	Base Concrete PCC M10/M15	7 days	Mon 28-12-15	Tue 05-01-16	7	
9	Excavation between ch. 15 to 30 m length	5 days	Wed 06-01-16	Tue 12-01-16	8	
10	Base Concrete PCC M10/M15	9 days	Wed 13-01-16	Mon 25-01-16	9	
11	Excavation between ch. 30 to 45 m length	6 days	Tue 26-01-16	Tue 02-02-16	10	
12	Base Concrete PCC M10/M15	10 days?	Wed 03-02-16	Tue 16-02-16	11	
13	Excavation between ch. 45 to 60 m length	8 days	Wed 17-02-16	Fri 26-02-16	12	
14	Base Concrete PCC M10/M15	12 days	Mon 29-02-16	Tue 15-03-16	13	
15	M20 sub-structure/super structure/Plum Concrete	60 days	Tue 26-01-16	Mon 18-04-16	10	
16	Construction of pier	60 days?	Tue 19-04-16	Mon 11-07-16	15	
17	Construction of Under sluice (12 M)	60 days?	Tue 19-04-16	Mon 11-07-16	15	
18	**Phase-II**	**243 days?**	**Thu 01-12-16**	**Mon 06-11-17**		
19	River diversion	14 days?	Thu 01-12-16	Tue 20-12-16		
20	Slip clearance (20000)	21 days?	Wed 21-12-16	Wed 18-01-17	19	
21	Excavation	28 days?	Thu 19-01-17	Mon 27-02-17	20	
22	Base Concrete PCC M10/M15	30 days?	Tue 28-02-17	Mon 10-04-17	21	
23	M20 sub-structure/super structure/Plum Concrete	60 days?	Tue 11-04-17	Mon 03-07-17	22	
24	Construction of balance work of Pier	90 days?	Tue 04-07-17	Mon 06-11-17	23	
25	Construction of balance work of Under sluice	90 days?	Tue 04-07-17	Mon 06-11-17	23	
26	**Weir Gate (5 m (W) x 6 m (H)**	**374 days?**	**Mon 12-01-15**	**Thu 16-06-16**		
27	Fabrication of Gates	120 days?	Fri 01-01-16	Thu 16-06-16		
28	Installation of bed embedments	1 day?	Mon 12-01-15	Mon 12-01-15		
29	Supply of Hoisting Arrangement	1 day?	Mon 12-01-15	Mon 12-01-15		
30	Installation of Gate	1 day?	Mon 12-01-15	Mon 12-01-15		
31	**Construction of Intake**	**602 days?**	**Mon 12-01-15**	**Tue 02-05-17**		
32	Slip clearance	21 days	Tue 15-12-15	Tue 12-01-16	5	
33	Protection work (R.R. Masonary)	30 days	Mon 21-12-15	Fri 29-01-16	1FS+10 days	
34	Excavation	7 days	Wed 13-01-16	Thu 21-01-16	32	
35	Base Concrete PCC M10/M15	24 days	Fri 22-01-16	Wed 07-12-16	34	
36	M20 sub-structure/super structure/Plum Concrete	90 days	Thu 08-12-16	Wed 12-04-17	35	
37	**Trash Rack**	**588 days?**	**Mon 12-01-15**	**Wed 12-04-17**		
38	Fabrication of Trash Rack	1 day?	Fri 01-01-16	Fri 01-01-16		
39	Installation of bed embedments	60 days?	Thu 19-01-17	Wed 12-04-17	36SS+30 day	
40	Installation of Trash Rack	1 day?	Mon 12-01-15	Mon 12-01-15		
41	**Intake Gate**	**383 days?**	**Fri 13-11-15**	**Tue 02-05-17**		
42	Fabrication of Gates	121 days?	Fri 13-11-15	Sat 30-04-16		
43	Installation of bed embedments	60 days	Thu 19-01-17	Wed 12-04-17	36SS+30 day	
44	Supply of Hoisting Arrangement	1 day?	Fri 01-01-16	Fri 01-01-16		
45	Installation of Gate	14 days	Thu 13-04-17	Tue 02-05-17	36	
46	**Construction of Power Duct**	**450 days?**	**Wed 13-01-16**	**Tue 03-10-17**		
47	Slip clearance	30 days?	Wed 13-01-16	Tue 23-02-16	32	
48	Excavation	60 days?	Wed 27-04-16	Tue 19-07-16	49	
49	RR Masonary (Protection Work)	60 days?	Wed 03-02-16	Tue 26-04-16	47SS+15 day	
50	Base Concrete	150 days?	Wed 20-07-16	Tue 14-02-17	48	
51	Concreting	150 days?	Wed 08-03-17	Tue 03-10-17	50FS+15 day	
52	Construction of Super passage	150 days?	Wed 20-07-16	Tue 14-02-17	48	
53	Laying RCC Slab	120 days?	Wed 15-02-17	Tue 01-08-17	52	
54	**Construction of Feeder Tunnel**	**309 days?**	**Wed 01-06-16**	**Mon 07-08-17**		
55	Removing of filled up silt	21 days	Wed 01-06-16	Wed 29-06-16		
56	Removing of under cuts etc	20 days?	Thu 30-06-16	Wed 27-07-16	55	
57	Construction of Portal at Inlet	21 days?	Thu 30-06-16	Thu 28-07-16	55	
58	Rock bolts & Shotcreting	21 days?	Wed 15-06-16	Wed 13-07-16	55SS+10 day	
59	Rib erection	21 days?	Fri 24-06-16	Fri 22-07-16	58SS+7 days	
60	Back fill concreting	21 days?	Fri 08-07-16	Fri 05-08-16	59SS+10 day	
61	Flooring (RCC)	21 days?	Mon 08-08-16	Mon 05-09-16	60	
62	Lining (RCC)	240 days?	Tue 06-09-16	Mon 07-08-17	61	
63	**De-silting tank**	**398 days?**	**Wed 20-07-16**	**Fri 26-01-18**		
64	Slip clearance	10 days?	Wed 20-07-16	Tue 02-08-16	48	
65	Excavation	21 days	Wed 26-10-16	Wed 23-11-16	66	

Each and every activity performed to construct the small hydro power plant was carefully listed. This helped us to create a basic understanding of the work compassed at the plant site. Based on this comprehension and project expert advice, we created three broad heads according to a their particular technical task, under which mainly each activity was carefully listed in table 4.1

Table 4.1: Description of questionnaire

	Questionnaire		
S.NO.	**Task A - Civil Works**	**Task B - Electro-Mechanical Works**	**Task C - Hydro-Mechanical Works**
Activity - 1.	Phase I - River diversion, Slip clearance, Excavation	Construction of Power House	Weir Gate
Activity - 2.	Phase II - River diversion, Slip clearance, Excavation, Base Concrete, Construction of balance work of Pier &Under sluice	Construction of Protection wall	Construction of Intake
Activity - 3.	Construction of Power Duct	Construction of Tail Race Channel	Trash Rack – Fabrication
Activity - 4.	Construction of Feeder Tunnel	Construction of Switchyard	Intake Gates - Installation of bed embedment's
Activity - 5.	De-Silting Tank		Penstock
Activity - 6.	Construction of Tunnel		
Activity - 7.	Construction of Power Channel		

Upon apprehension of the description about the activities executed. In the study a list was developed of skill set required to perform each set of activity. For example – In Task A- Civil Works, Activity 1- River Diversion, Activity 2 - Slip clearance. The below table 4.2 is the example of how skill sets were listed for each activity.

Table 4.2: List of Activity wise skill sets of Skilled Laborers - Civil Works (only construction stage of Small Hydro Power Projects) (Detailed is attached in Appendix)

S.No.	Task A – Civil Works	Skill sets required
Activity - 1.	River diversion	Foundry man
		Sheet Metal Works
		Welding skills
		Masonry
		Power Electrician skills
		Fitter's Skills works
		Turner Skills works
		Mechanical works
		Construction Machinery Mechanic cum Operational works
		Draughtsman (Civil) Skills works
		Surveyor's Skills
		Crane Operational works
Activity - 2.	Slip clearance (23500(Weir)+2600(FT))=32830)	Masonry
		Draughtsman (Civil) Skills
		Construction Machinery Mechanic cum Operator
		Surveyor's Skills
		Crane Operating Skills

Based on the above account, questionnaire was developed on which the respondents were requested to give responses, that are collected over a five point Likert's scale(1 being 'No Gap'; 2 'Less Gap'; 3 'Neutral'; 4 'High Gap'; 5 'Very High Gap') (Vagias &Wade, 2006)

The aim in this study is to ascertain the human resource requirement. Hence Questionnaires were:

1. Civil Works Questionnaire (Appendix No 5)
2. Electro-Mechanical Works Questionnaire (Appendix No 6)
3. Hydro-Mechanical Works Questionnaire (Appendix No 7)

Anextensive survey was done to understand the activity wise significant skill gaps. For this Spss 21 version was used. The Significance level was taken above 0.71 (hair Etall 1998, Comrey and lee, 1992). Comry and lee 1992 cites a demanding cut-off as 0.32 to be considered (poor), 0.45 could be considered (fair), 0.55 could be considered (good), 0.63 could be considered (very good) or 0.71could be considered (excellent).

The study for the purpose of reduction of data has pre-owned Factor Loading technique. The mentioned technique for statistics of multivariate would be observed for three major reasons: (i) Reduction of variable count, from i.e.; 48 to 18. (ii) Creattion of dimensions among the variables that are measured and construct observed (iii) Establish evidence with the construct validity

While the uses of Factor Loading including (i) Descriptive Statistics (ii) Correlation Matrix; (iii) Reliability, validity & internal Consistency; (iv) Total Variance and (v) Rotated Component Matrix, have been discussed in detail below

KMO & Bartlett's Test of Sphericity as a measure of sampling adequacy is used to check the case to variable ratio for the analysis being conducted. While the KMO ranges from 0 to 1, we have accepted index over 0.6. Also, the Bartlett's Test of Sphericity relates to the significance of the study and thereby shows the validity and suitability of the responses collected to the problem being addressed through the study. For Factor Analysis to be recommended suitable, the Bartlett's Test of Sphericity must be less than 0.05. Another important aspect that needs mention is the Rotated Component Matrix. While deciding how many factors we would analyze is whether a variable might relate to more than one factor. Rotation maximizes high item loadings and

minimizes low item loadings, thereby producing a more interpretable and simplified solution. The rotation techniques used is - orthogonal varimax rotation that produces factor structures that are uncorrelated.

4.6 TASK 'A' – CIVIL WORKS

In a Hydro power Project (a plant in construction), there is a lot of work and learning opportunities in a civil works area. A Hydropower Project is 80% Civil Construction work. It starts from conceptual planning of the scheme. Then investigation of site. Preparation of project reports; estimates cost; commercial viability followed by tender stage designs i.e. hydraulic and structural. Then construction stage designs and execution of gigantic structures like dams tunnels power houses (underground or surface}. Solving problems during construction and final commissioning.

Respondents were questioned about significant skills sets required in Civil Activity Areas and (i) Correlation Matrix (ii) Reliability; Validity & Internal Consistency (iii) Total Variance (iv) Rotated Component Matrix results are as below-

4.6.1 Civil Activity 1- Phase I

Table 4.3: Correlation Matrix - Civil Activity 1- Phase I

Correlation Matrix[a]																
		Foundry man	Sheet Metal Works	Welding skills	Masonry	Power Electrician skills	Fitters Skills	Turner Skills	Crane Mechanical works	Construction Machinery Mechanic cum Operational works	Draughts man Civil Skills	Surveyors Skills	Crane Operational works	Plumbing Skills	Lineman Skills	Gas Cutter	Sheet Metal Worker
Correlation	Foundry man	1.000	.008	.032	-.039	.021	.051	.137	.053	-.031	.010	-.032	.023	-.006	-.020	.003	.026
	Sheet Metal Works	.008	1.000	.037	-.043	.016	.001	.043	.019	-.018	.014	.044	.036	.074	-.014	.000	.410
	Welding skills	.032	.037	1.000	.091	-.077	.071	.048	.022	-.025	.005	-.022	.168	.085	.089	-.047	-.071
	Masonry	-.039	-.043	.091	1.000	.083	-.014	.077	.019	.054	-.003	.102	.075	-.062	.020	-.062	.009
	Power Electrician skills	.021	.016	-.077	.083	1.000	-.037	-.006	.045	.047	.066	.074	.060	.047	.052	.053	.052
	Fitters Skills	.051	.001	.071	-.014	-.037	1.000	.043	-.042	-.068	.099	-.067	-.084	-.035	.082	-.026	.117
	Turner Skills	.137	.043	.048	.077	-.006	.043	1.000	-.014	.006	.006	.041	.131	.060	.100	-.036	.013
	Crane Mechanical works	.053	.019	.022	.019	.045	-.042	-.014	1.000	-.022	-.056	.039	-.133	-.007	.107	.080	-.048
	Construction Machinery Mechanic cum Operational works	-.031	-.018	-.025	.054	.047	-.068	.006	-.022	1.000	-.005	.072	.194	.181	.003	-.020	-.005
	Draughtsman Civil Skills	.010	.014	.005	-.003	.066	.099	.006	-.056	-.005	1.000	.002	.091	.035	.067	.096	.064
	Surveyors Skills	-.032	.044	-.022	.102	.074	-.067	.041	.039	.072	.002	1.000	.089	.099	.014	-.040	-.020
	Crane Operational works	.023	.036	.168	.075	.060	-.084	.131	-.133	.194	.091	.089	1.000	.132	.121	.074	-.044
	Plumbing Skills	-.006	.074	.085	-.062	.047	-.035	.060	-.007	.181	.035	.099	.132	1.000	-.022	.023	-.068
	Lineman Skills	-.020	-.014	.089	.020	.052	.082	.100	.107	.003	.067	.014	.121	-.022	1.000	.028	-.009
	Gas Cutter	.003	.000	-.047	-.062	.053	-.026	-.036	.080	-.020	.096	-.040	.074	.023	.028	1.000	-.036
	Sheet Metal Worker	.026	.410	-.071	.009	.052	.117	.013	-.048	-.005	.064	-.020	-.044	-.068	-.009	-.036	1.000
Sig. (1-tailed)	Foundry man		.436	.257	.214	.330	.146	.002	.136	.259	.419	.257	.315	.452	.339	.474	.293
	Sheet Metal Works	.436		.220	.190	.371	.488	.187	.347	.355	.385	.185	.227	.065	.383	.499	.000
	Welding skills	.257	.220		.031	.058	.072	.162	.326	.305	.457	.329	.000	.040	.034	.167	.071
	Masonry	.214	.190	.031		.045	.387	.057	.350	.134	.478	.017	.060	.102	.343	.103	.430
	Power Electrician skills	.330	.371	.058	.045		.226	.452	.175	.168	.087	.065	.107	.169	.144	.139	.144
	Fitters Skills	.146	.488	.072	.387	.226		.189	.194	.081	.021	.084	.042	.238	.046	.295	.008
	Turner Skills	.002	.187	.162	.057	.452	.189		.384	.451	.451	.198	.003	.110	.020	.227	.393
	Crane Mechanical works	.136	.347	.326	.350	.175	.194	.384		.328	.126	.212	.003	.442	.014	.051	.162
	Construction Machinery Mechanic cum Operational works	.259	.355	.305	.134	.168	.081	.451	.328		.463	.070	.000	.000	.474	.344	.457
	Draughtsman Civil Skills	.419	.385	.457	.478	.087	.021	.451	.126	.463		.486	.030	.239	.083	.024	.095
	Surveyors Skills	.257	.185	.329	.017	.065	.084	.198	.212	.070	.486		.033	.021	.384	.203	.337
	Crane Operational works	.315	.227	.000	.060	.107	.042	.003	.003	.000	.030	.033		.003	.006	.064	.185
	Plumbing Skills	.452	.065	.040	.102	.169	.238	.110	.442	.000	.239	.021	.003		.327	.320	.080
	Lineman Skills	.339	.383	.034	.343	.144	.046	.020	.014	.474	.083	.384	.006	.327		.286	.426
	Gas Cutter	.474	.499	.167	.103	.139	.295	.227	.051	.344	.024	.203	.064	.320	.286		.231
	Sheet Metal Worker	.293	.000	.071	.430	.144	.008	.393	.162	.457	.095	.337	.185	.080	.426	.231	

a. Determinant = .505

4.6.1.1 Reliability, Validity & Internal Consistency - Civil Activity 1- Phase I

Civil Activity 1	KMO and Bartlett's Test		Reliability Statistics	
Phase I - River diversion,Slip clearance,Excavation	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.493	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	285.771	.611
		Df	120	
		Sig.	.000	

Table 4.4: Reliability, Validity & Internal Consistency - Civil Activity 1- Phase I

In the table 4.4, (i) Cronbachs Alpha is 0.611, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.6.1.2 Total Variance - Civil Activity 1- Phase I

Table 4.5: Total Variance - Civil Activity 1- Phase I

	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.577	9.857	9.857	1.577	9.857	9.857	1.442	9.012	9.012
2	1.464	9.150	19.006	1.464	9.150	19.006	1.429	8.932	17.944
3	1.295	8.096	27.102	1.295	8.096	27.102	1.234	7.712	25.656
4	1.204	7.526	34.629	1.204	7.526	34.629	1.234	7.710	33.365
5	1.177	7.353	41.982	1.177	7.353	41.982	1.221	7.632	40.997
6	1.113	6.956	48.938	1.113	6.956	48.938	1.164	7.277	48.274
7	1.055	6.595	55.532	1.055	6.595	55.532	1.161	7.258	55.532
8	.973	6.082	61.615						
9	.934	5.837	67.451						
10	.917	5.734	73.185						
11	.860	5.376	78.562						
12	.828	5.178	83.739						
13	.800	4.999	88.739						
14	.672	4.197	92.936						

15	.605	3.783	96.719						
16	.525	3.281	100.000						
Extraction Method: Principal Component Analysis.									

Explanation of the total variance is done with help of the initial 8 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 8 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Activity 1- Phase I - River diversion, Slip clearance, Excavation

4.6.1.3 Rotated Component Matrix- Civil Activity 1- Phase I

Table 4.6: Rotated Component Matrix- Civil Activity 1- Phase I

	Component						
	1	2	3	4	5	6	7
Plumbing Skills	.663						
Construction Machinery Mechanic cum Operational works	.581						
Crane Operational works	.549						
Fitters Skills	-.401						
Sheet Metal Works		.841					
Sheet Metal Worker		.819					
Welding skills			.769				
Lineman Skills			.460				
Draughtsman Civil Skills				.696			
Gas Cutter				.520			
Power Electrician skills							
Masonry					.748		
Surveyors Skills					.462		
Foundry-man						.804	
Turner Skills						.678	
Crane Mechanical works							.843
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]							
a. Rotation converged in 13 iterations.							

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called ‘Component’. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.6.2 Civil Activity 2- Phase II

Table 4.7: Correlation Matrix - Civil Activity 2- Phase II

Correlation Matrix[a]																	
		Foundry man	Sheet Metal Works	Welding skills	Masonry	Power Electricians kills	Fitters Skills	Turner Skills	Crane Mechanic	Construction Machinery Mechanic cum Operational works	Draughtsman Civil Skills	Surveyors Skills	Crane Operating Skills	Plumbing Skills	Lineman Skills	Gas Cutter	Carpenters Skills
Correlation	Foundry man	1.000	-.040	-.022	.033	-.076	.138	-.039	-.011	.017	.009	-.042	.027	-.032	.081	-.045	-.024
	Sheet Metal Works	-.040	1.000	.043	-.053	.085	.082	.106	.024	.026	-.017	.001	-.039	.093	-.046	.043	.041
	Welding skills	-.022	.043	1.000	.014	-.080	.007	-.003	.009	.017	.049	-.044	.007	.095	-.002	-.035	.022
	Masonry	.033	-.053	.014	1.000	-.019	.057	-.002	.056	.004	.054	.050	-.123	-.066	.039	.079	-.036
	Power Electrician skills	-.076	.085	-.080	-.019	1.000	-.075	-.013	.039	.045	.007	-.024	-.044	.085	-.010	-.051	.017
	Fitters Skills	.138	.082	.007	.057	-.075	1.000	-.001	-.012	.038	.035	.017	-.028	.002	-.003	.026	.120
	Turner Skills	-.039	.106	-.003	-.002	-.013	-.001	1.000	.068	-.103	-.057	.034	.068	.008	.031	-.055	.044
	Crane Mechanic	-.011	.024	.009	.056	.039	-.012	.068	1.000	-.100	-.030	-.048	.015	.066	-.010	.069	.108
	Construction Machinery Mechanic cum Operational works	.017	.026	.017	.004	.045	.038	-.103	-.100	1.000	.033	-.008	.025	-.010	-.063	-.039	.040
	Draughtsman Civil Skills	.009	-.017	.049	.054	.007	.035	-.057	-.030	.033	1.000	.071	-.041	-.028	.053	.065	-.022
	Surveyors Skills	-.042	.001	-.044	.050	-.024	.017	.034	-.048	-.008	.071	1.000	-.029	.000	-.006	-.049	-.042
	Crane Operating Skills	.027	-.039	.007	-.123	-.044	-.028	.068	.015	.025	-.041	-.029	1.000	-.014	-.052	-.020	-.090
	Plumbing Skills	-.032	.093	.095	-.066	.085	.002	.008	.066	-.010	-.028	.000	-.014	1.000	-.059	-.125	.018
	Lineman Skills	.081	-.046	-.002	.039	-.010	-.003	.031	-.010	-.063	.053	-.006	-.052	-.059	1.000	.041	.046
	Gas Cutter	-.045	.043	-.035	.079	-.051	.026	-.055	.069	-.039	.065	-.049	-.020	-.125	.041	1.000	.127
	Carpenters Skills	-.024	.041	.022	-.036	.017	.120	.044	.108	.040	-.022	-.042	-.090	.018	.046	.127	1.000
Sig. (1-tailed)	Foundry man		.206	.325	.250	.060	.002	.214	.412	.364	.429	.191	.291	.256	.047	.176	.314
	Sheet Metal Works	.206		.190	.136	.040	.046	.015	.313	.299	.367	.489	.210	.027	.170	.189	.198
	Welding skills	.325	.190		.391	.049	.440	.475	.425	.361	.158	.184	.445	.025	.480	.237	.327
	Masonry	.250	.136	.391		.345	.122	.480	.124	.471	.135	.151	.006	.089	.214	.052	.229
	Power Electrician skills	.060	.040	.049	.345		.062	.395	.210	.175	.442	.311	.182	.041	.416	.145	.362
	Fitters Skills	.002	.046	.440	.122	.062		.490	.402	.220	.233	.364	.285	.486	.476	.300	.007
	Turner Skills	.214	.015	.475	.480	.395	.490		.082	.017	.122	.245	.079	.434	.262	.130	.185
	Crane Mechanic	.412	.313	.425	.124	.210	.402	.082		.019	.269	.160	.380	.086	.416	.078	.013
	Construction Machinery Mechanic cum Operational works	.364	.299	.361	.471	.175	.220	.017	.019		.246	.437	.307	.420	.097	.208	.203
	Draughtsman Civil Skills	.429	.367	.158	.135	.442	.233	.122	.269	.246		.071	.198	.283	.138	.089	.327
	Surveyors Skills	.191	.489	.184	.151	.311	.364	.245	.160	.437	.071		.274	.497	.447	.156	.194
	Crane Operating Skills	.291	.210	.445	.006	.182	.285	.079	.380	.307	.198	.274		.384	.141	.343	.031
	Plumbing Skills	.256	.027	.025	.089	.041	.486	.434	.086	.420	.283	.497	.384		.114	.005	.354
	Lineman Skills	.047	.170	.480	.214	.416	.476	.262	.416	.097	.138	.447	.141	.114		.199	.174
	Gas Cutter	.176	.189	.237	.052	.145	.300	.130	.078	.208	.089	.156	.343	.005	.199		.004
	Carpenters Skills	.314	.198	.327	.229	.362	.007	.185	.013	.203	.327	.194	.031	.354	.174	.004	
a. Determinant = .708																	

4.6.2.1 Reliability, Validity & Internal Consistency - Civil Activity 2- Phase II

Table 4.8: Reliability, Validity & Internal Consistency - Civil Activity 2- Phase II				
Civil Activity 2	**KMO and Bartlett's Test**			**Reliability Statistics**
Phase II - River diversion, Slip clearance, Excavation, Base Concrete, Construction of balance work of Pier &Under sluice	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.586	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	144.238	.767
		Df	120	
		Sig.	.065	

In the table 4.8, (i) Cronbachs Alpha is 0.767, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.6.2.2Total Variance - Civil Activity 2- Phase II

Table 4.9: Total Variance - Civil Activity 2- Phase II

	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.378	8.610	8.610	1.378	8.610	8.610	1.252	7.823	7.823
2	1.326	8.288	16.898	1.326	8.288	16.898	1.229	7.680	15.503
3	1.215	7.594	24.493	1.215	7.594	24.493	1.214	7.588	23.090
4	1.184	7.399	31.891	1.184	7.399	31.891	1.201	7.507	30.598
5	1.130	7.064	38.955	1.130	7.064	38.955	1.191	7.445	38.043
6	1.077	6.730	45.685	1.077	6.730	45.685	1.136	7.098	45.141
7	1.061	6.632	52.317	1.061	6.632	52.317	1.094	6.838	51.979
8	1.009	6.303	58.620	1.009	6.303	58.620	1.063	6.641	58.620
9	.968	6.049	64.669						
10	.939	5.872	70.541						
11	.923	5.770	76.310						
12	.828	5.177	81.487						

13	.793	4.955	86.442						
14	.772	4.823	91.265						
15	.742	4.638	95.903						
Extraction Method: Principal Component Analysis.									

Explanation of the total variance is done with help of the initial 12 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 12 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Civil Activity 2- Phase II - River diversion, Slip clearance, Excavation, Base Concrete, Construction of balance work of Pier &Under sluice.

4.6.2.3 Rotated Component Matrix - Civil Activity 2- Phase II

Table 4.10 : Rotated Component Matrix – Civil Activity 2 – Phase II

	Component							
	1	2	3	4	5	6	7	8
Sheet Metal Works	.677							
Carpenters Skills	.547							
Gas Cutter		.723						
Plumbing Skills		-.639						
Construction Machinery Mechanic cum Operational works			-.671					
Turner Skills			.589					
Crane Mechanic			.503					
Foundry man				.721				
Fitters Skills				.670				
Masonry					.667			
Crane Operating Skills					-.647			
Surveyors Skills						.744		
Welding skills							.835	
Power Electrician skills							-.433	
Draughtsman Civil Skills								
Lineman Skills								.845
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]								
a. Rotation converged in 20 iterations.								

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called ‘Component’. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.6.3 Civil Activity 3 - Construction of Power Duct

Table 4.11: Correlation Matrix - Civil Activity 3 - Construction of Power Duct

Correlation Matrix																		
		Masonry	Draughtsman Civil Skills	Construction Machinery Mechanic cum Operator	Surveyors Skills	Crane Operating Skills	Plumbing Skills	Lineman Skills	Welding Skills	Sheet Metal Worker	Electrician	Wireman Skills	Foundry man	Carpenters Skills	Gas Cutter	Fitters Skills	Turner Skills	Draughtsman Mechanical	Crane Mechanic
Correlation	Masonry	1.000	.045	.062	-.031	.086	-.018	-.028	.002	.024	.158	-.020	.084	.083	.123	-.025	.003	-.081	.024
	Draughtsman Civil Skills	.045	1.000	-.005	.002	.091	.035	.067	.067	.064	.106	.024	.082	-.006	.096	.058	.031	.059	-.038
	Construction Machinery Mechanic cum Operator	.062	-.005	1.000	.072	.194	.181	.003	.065	-.005	.055	-.031	.031	.035	-.020	-.086	-.015	.018	-.001
	Surveyors Skills	-.031	.002	.072	1.000	.089	.099	.014	.027	-.020	.107	.005	.020	.011	-.040	-.092	.016	-.017	.052
	Crane Operating Skills	.086	.091	.194	.089	1.000	.132	.121	.311	-.044	.172	.197	.154	-.029	.074	-.147	.119	-.011	-.102
	Plumbing Skills	-.018	.035	.181	.099	.132	1.000	-.022	.130	-.068	.043	-.129	.151	.085	.023	.035	.027	.122	.021
	Lineman Skills	-.028	.067	.003	.014	.121	-.022	1.000	.065	-.009	.113	.064	.092	.088	.028	.126	.134	.024	.143
	Welding Skills	.002	.067	.065	.027	.311	.130	.065	1.000	.032	.174	.100	.143	.020	.072	-.105	.137	.107	.027
	Sheet Metal Worker	.024	.064	-.005	-.020	-.044	-.068	-.009	.032	1.000	.132	-.011	.043	-.025	-.036	.046	.006	.009	-.064
	Electrician	.158	.106	.055	.107	.172	.043	.113	.174	.132	1.000	.095	.150	.014	.079	.026	.045	-.005	.010
	Wireman Skills	-.020	.024	-.031	.005	.197	-.129	.064	.100	-.011	.095	1.000	-.029	-.008	.069	-.008	.092	-.048	-.017
	Foundry man	.084	.082	.031	.020	.154	.151	.092	.143	.043	.150	-.029	1.000	.044	-.011	-.032	.052	.109	.080
	Carpenters Skills	.083	-.006	.035	.011	-.029	.085	.088	.020	-.025	.014	-.008	.044	1.000	.127	.125	.052	.076	.193
	Gas Cutter	.123	.096	-.020	-.040	.074	.023	.028	.072	-.036	.079	.069	-.011	.127	1.000	.011	-.008	-.063	.086
	Fitters Skills	-.025	.058	-.086	-.092	-.147	.035	.126	-.105	.046	.026	-.008	-.032	.125	.011	1.000	.042	-.039	.021
	Turner Skills	.003	.031	-.015	.016	.119	.027	.134	.137	.006	.045	.092	.052	.052	-.008	.042	1.000	-.005	.012
	Draughtsman Mechanical	-.081	.059	.018	-.017	-.011	.122	.024	.107	.009	-.005	-.048	.109	.076	-.063	-.039	-.005	1.000	.094
	Crane Mechanic	.024	-.038	-.001	.052	-.102	.021	.143	.027	-.064	.010	-.017	.080	.193	.086	.021	.012	.094	1.000
Sig. (1-tailed)	Masonry		.176	.102	.259	.038	.355	.281	.484	.310	.001	.343	.041	.043	.006	.305	.478	.048	.309
	Draughtsman Civil Skills	.176		.463	.486	.030	.239	.083	.083	.095	.014	.312	.046	.450	.024	.117	.263	.113	.219
	Construction Machinery Mechanic cum Operator	.102	.463		.070	.000	.000	.474	.090	.457	.130	.262	.260	.233	.344	.039	.377	.355	.495
	Surveyors Skills	.259	.486	.070		.033	.021	.384	.290	.337	.013	.457	.340	.414	.203	.029	.372	.367	.141
	Crane Operating Skills	.038	.030	.000	.033		.003	.006	.000	.185	.000	.000	.001	.277	.064	.001	.007	.413	.018
	Plumbing Skills	.355	.239	.000	.021	.003		.327	.004	.080	.191	.004	.001	.040	.320	.236	.289	.006	.331
	Lineman Skills	.281	.083	.474	.384	.006	.327		.090	.426	.010	.095	.028	.035	.286	.005	.003	.311	.002
	Welding Skills	.484	.083	.090	.290	.000	.004	.090		.257	.000	.020	.002	.341	.069	.016	.002	.014	.292
	Sheet Metal Worker	.310	.095	.457	.337	.185	.080	.426	.257		.003	.408	.189	.305	.231	.171	.447	.423	.094
	Electrician	.001	.014	.130	.013	.000	.191	.010	.000	.003		.025	.001	.388	.052	.298	.177	.459	.422
	Wireman Skills	.343	.312	.262	.457	.000	.004	.095	.020	.408	.025		.274	.438	.078	.434	.028	.160	.363
	Foundry man	.041	.046	.260	.340	.001	.001	.028	.002	.189	.001	.274		.185	.410	.254	.142	.013	.050
	Carpenters Skills	.043	.450	.233	.414	.277	.040	.035	.341	.305	.388	.438	.185		.004	.005	.145	.060	.000
	Gas Cutter	.006	.024	.344	.203	.064	.320	.286	.069	.231	.052	.078	.410	.004		.414	.437	.097	.037
	Fitters Skills	.305	.117	.039	.029	.001	.236	.005	.016	.171	.298	.434	.254	.005	.414		.193	.209	.333
	Turner Skills	.478	.263	.377	.372	.007	.289	.003	.002	.447	.177	.028	.142	.145	.437	.193		.458	.401
	Draughtsman Mechanical	.048	.113	.355	.367	.413	.006	.311	.014	.423	.459	.160	.013	.060	.097	.209	.458		.026
	Crane Mechanic	.309	.219	.495	.141	.018	.331	.002	.292	.094	.422	.363	.050	.000	.037	.333	.401	.026	

4.6.3.1 Reliability, Validity & Internal Consistency - Civil Activity 3 - Construction of Power Duct

Table 4.12: Reliability, Validity & Internal Consistency - Civil Activity 3 - Construction of Power Duct

Civil Activity 3	KMO and Bartlett's Test			Reliability Statistics
Construction of Power Duct	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.592	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	389.032	.645
		Df	153	
		Sig.	.000	

In the table 4.12, (i) Cronbachs Alpha is 0.645, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.6.3.2 Total Variance - Civil Activity 3 - Construction of Power Duct

Table 4.13: Total Variance - Civil Activity 3 - Construction of Power Duct

Component		Initial Eigen values[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	3.153	11.402	11.402	1.963	10.907	10.907	1.600	8.890	8.890
	2	2.271	8.213	19.615	1.366	7.589	18.496	1.353	7.519	16.409
	3	2.133	7.714	27.329	1.389	7.719	26.215	1.344	7.466	23.875
	4	1.990	7.198	34.528	1.193	6.626	32.841	1.257	6.984	30.859
	5	1.805	6.529	41.057	1.130	6.277	39.118	1.206	6.697	37.556
	6	1.717	6.209	47.266	1.077	5.981	45.099	1.188	6.600	44.156
	7	1.651	5.971	53.237	1.077	5.983	51.082	1.109	6.162	50.319
	8	1.547	5.595	58.832	.938	5.213	56.295	1.076	5.976	56.295
	9	1.453	5.256	64.088						
	10	1.377	4.979	69.067						
	11	1.318	4.767	73.834						
	12	1.219	4.407	78.241						
	13	1.122	4.058	82.299						
	14	1.102	3.986	86.285						

15	1.058	3.827	90.112						
16	.981	3.547	93.659						
17	.921	3.329	96.989						
Extraction Method: Principal Component Analysis.									
a. When analyzing a covariance matrix, the initial Eigen values are the same across the raw and rescaled solution.									

Explanation of the total variance is done with help of the initial 8 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 8 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Civil works Activity 3.- Construction of Power Duct

4.6.3.3 Rotated Component Matrix - Civil Activity 3 - Construction of Power Duct

Table 4.14: Rotated Component Matrix - Civil Activity 3 - Construction of Power Duct

	Raw								Rescaled							
	Component								Component							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Masonry																
Draughts man Civil Skills																
Construction Machinery Mechanic cum Operator							1.185								.877	
Surveyors Skills								1.112								.881
Crane Operating Skills	.866								.689							
Plumbing Skills				1.170								.884				
Lineman Skills																
Welding Skills	.837								.676							
Sheet Metal Worker			.555								.486					
Electrician			.979								.747					
Wireman Skills																
Foundry man			.492								.406					

Carpenters Skills		.522								.479						
Gas Cutter					1.133								.851			
Fitters Skills	-.563								-.486							
Turner Skills						1.163								.861		
Draughtsman Mechanical					-.585								-.438			
Crane Mechanic		1.018								.821						
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]																
a. Rotation converged in 11 iterations.																

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.6.4 Civil Activity 4.- Construction of Feeder Tunnel

Table 4.15: Correlation Matrix - Construction of Feeder Tunnel

Correlation Matrix																		
		Masonry	Draughts man Civil Skills	Construction Machinery Mechanic cum Operator	Surveyors Skills	Crane Operating Skills	Lineman Skills	Welding Skills	Sheet Metal Worker	Electrician	Wireman Skills	Plumbing Skills	Foundry man	Carpenters Skills	Gas-Cutter	Draughtsman Mechanical	Storekeeper	Housekeeper
Correlation	Masonry	1.000	.045	.062	-.031	.086	-.028	.002	.024	.158	-.020	-.018	.084	.083	.123	-.081	.006	-.029
	Draughts man Civil Skills	.045	1.000	-.005	.002	.091	.067	.067	.064	.106	.024	.035	.082	-.006	.096	.059	.026	.059
	Construction Machinery Mechanic cum Operator	.062	-.005	1.000	.072	.194	.003	.065	-.005	.055	-.031	.181	.031	.035	-.020	.018	-.062	.019
	Surveyors Skills	-.031	.002	.072	1.000	.089	.014	.027	-.020	.107	.005	.099	.020	.011	-.040	-.017	.016	.002
	Crane Operating Skills	.086	.091	.194	.089	1.000	.121	.311	-.044	.172	.197	.132	.154	-.029	.074	-.011	-.184	.005
	Lineman Skills	-.028	.067	.003	.014	.121	1.000	.065	-.009	.113	.064	-.022	.092	.088	.028	.024	-.007	.063
	Welding Skills	.002	.067	.065	.027	.311	.065	1.000	.032	.174	.100	.130	.143	.020	.072	.107	-.190	.093
	Sheet Metal Worker	.024	.064	-.005	-.020	-.044	-.009	.032	1.000	.132	-.011	-.068	.043	-.025	-.036	.009	-.005	.059
	Electrician	.158	.106	.055	.107	.172	.113	.174	.132	1.000	.095	.043	.150	.014	.079	-.005	-.057	.081
	Wireman Skills	-.020	.024	-.031	.005	.197	.064	.100	-.011	.095	1.000	-.129	-.029	-.008	.069	-.048	-.045	-.017
	Plumbing Skills	-.018	.035	.181	.099	.132	-.022	.130	-.068	.043	-.129	1.000	.151	.085	.023	.122	-.082	.046
	Foundry man	.084	.082	.031	.020	.154	.092	.143	.043	.150	-.029	.151	1.000	.044	-.011	.109	-.071	.059
	Carpenters Skills	.083	-.006	.035	.011	-.029	.088	.020	-.025	.014	-.008	.085	.044	1.000	.127	.076	.006	.131
	Gas-Cutter	.123	.096	-.020	-.040	.074	.028	.072	-.036	.079	.069	.023	-.011	.127	1.000	-.063	.046	-.019
	Draughtsman Mechanical	-.081	.059	.018	-.017	-.011	.024	.107	.009	-.005	-.048	.122	.109	.076	-.063	1.000	-.031	.136
	Storekeeper	.006	.026	-.062	.016	-.184	-.007	-.190	-.005	-.057	-.045	-.082	-.071	.006	.046	-.031	1.000	-.098
	Housekeeper	-.029	.059	.019	.002	.005	.063	.093	.059	.081	-.017	.046	.059	.131	-.019	.136	-.098	1.000
Sig. (1-tailed)	Masonry		.176	.102	.259	.038	.281	.484	.310	.001	.343	.355	.041	.043	.006	.048	.452	.277
	Draughtsman Civil Skills	.176		.463	.486	.030	.083	.083	.095	.014	.312	.239	.046	.450	.024	.113	.294	.113
	Construction Machinery Mechanic cum Operator	.102	.463		.070	.000	.474	.090	.457	.130	.262	.000	.260	.233	.344	.355	.103	.348
	Surveyors Skills	.259	.486	.070		.033	.384	.290	.337	.013	.457	.021	.340	.414	.203	.367	.372	.486
	Crane Operating Skills	.038	.030	.000	.033		.006	.000	.185	.000	.000	.003	.001	.277	.064	.413	.000	.462
	Lineman Skills	.281	.083	.474	.384	.006		.090	.426	.010	.095	.327	.028	.035	.286	.311	.443	.098
	Welding Skills	.484	.083	.090	.290	.000	.090		.257	.000	.020	.004	.002	.341	.069	.014	.000	.027
	Sheet Metal Worker	.310	.095	.457	.337	.185	.426	.257		.003	.408	.080	.189	.305	.231	.423	.462	.111
	Electrician	.001	.014	.130	.013	.000	.010	.000	.003		.025	.191	.001	.388	.052	.459	.121	.048
	Wireman Skills	.343	.312	.262	.457	.000	.095	.020	.408	.025		.004	.274	.438	.078	.160	.175	.363
	Plumbing Skills	.355	.239	.000	.021	.003	.327	.004	.080	.191	.004		.001	.040	.320	.006	.046	.174
	Foundry man	.041	.046	.260	.340	.001	.028	.002	.189	.001	.274	.001		.185	.410	.013	.071	.113
	Carpenters Skills	.043	.450	.233	.414	.277	.035	.341	.305	.388	.438	.040	.185		.004	.060	.452	.004
	Gas-Cutter	.006	.024	.344	.203	.064	.286	.069	.231	.052	.078	.320	.410	.004		.097	.173	.351
	Draughtsman Mechanical	.048	.113	.355	.367	.413	.311	.014	.423	.459	.160	.006	.013	.060	.097		.264	.002
	Storekeeper	.452	.294	.103	.372	.000	.443	.000	.462	.121	.175	.046	.071	.452	.173	.264		.022
	Housekeeper	.277	.113	.348	.486	.462	.098	.027	.111	.048	.363	.174	.113	.004	.351	.002	.022	

4.6.4.1 Reliability, Validity & Internal Consistency - Construction of Feeder Tunnel

Table 4.16: Reliability, Validity & Internal Consistency - Construction of Feeder Tunnel				
Civil Activity 4	**KMO and Bartlett's Testa**			**Reliability Statistics**
Construction of Feeder Tunnel	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.618	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	341.876	.607
		Df	136	
		Sig.	.000	

In the table 4.16, (i) Cronbachs Alpha is 0.767, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.6.4.2: Total Variance - Construction of Feeder Tunnel

Table 4.17: Total Variance Explained- Construction of Feeder Tunnel										
		Initial Eigen values[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	3.209	12.345	12.345	1.999	11.758	11.758	1.652	9.719	9.719
	2	2.261	8.696	21.041	1.366	8.038	19.796	1.380	8.118	17.837
	3	2.006	7.715	28.756	1.219	7.173	26.969	1.298	7.633	25.470
	4	1.907	7.334	36.090	1.199	7.055	34.024	1.284	7.550	33.020
	5	1.762	6.776	42.866	1.092	6.425	40.449	1.220	7.176	40.196
	6	1.611	6.196	49.062	1.054	6.199	46.647	1.097	6.451	46.647
	7	1.513	5.821	54.883						
	8	1.459	5.612	60.495						
	9	1.381	5.312	65.807						
	10	1.334	5.133	70.940						
	11	1.256	4.833	75.773						
	12	1.168	4.494	80.267						
	13	1.159	4.457	84.724						

	14	1.080	4.152	88.876						
	15	1.054	4.053	92.929						
	16	.977	3.758	96.687						
Extraction Method: Principal Component Analysis.										
a. When analyzing a covariance matrix, the initial eigenvalues are the same across the raw and rescaled solution.										

Explanation of the total variance is done with help of the initial 8 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 8 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Civil works Activity 4.- Construction of Feeder Tunnel

4.6.4.3 Rotated Component Matrix - Construction of Feeder Tunnel

Table 4.18: Rotated Component Matrix - Construction of Feeder Tunnel

	Raw						Rescaled					
	Component						Component					
	1	2	3	4	5	6	1	2	3	4	5	6
Masonry			.599						.500			
Draughtsman Civil Skills												
Construction Machinery Mechanic cum Operator				1.093						.809		
Surveyors Skills						1.039						.823
Crane Operating Skills	.895						.712					
Lineman Skills												
Welding Skills	.795						.642					
Sheet Metal Worker			.557						.489			
Electrician			.942						.720			
Wireman Skills	.461						.416					
Plumbing Skills				.780						.589		
Foundry man												
Carpenters Skills												
Gas-Cutter					1.152						.865	
Draughtsman Mechanical		1.069						.801				
Storekeeper	-.785						-.606					

Housekeeper		.513						.438				

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 7 iterations.

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.6.5 Civil Activity – 5 - De-Silting Tank

Table 4.19: Correlation Matrix - De-Silting Tank

Correlation Matrix[a]																	
		Lineman Skills	Wireman Skills	Electrician	Operating Skills PLC System	Surveyors Skills	Crane Operating Skills	Plumbing Skills	Foundry man	Carpenters Skills	Sheet Metal Worker	Welding Skills	Masonry	Gas Cutter	Refrigeration and Air-conditioning Mechanic	Draughtsman Civil Skills	Draughtsman Mechanical
Correlation	Lineman Skills	1.000	.064	.113	.089	.014	.121	-.022	.092	.088	-.009	.065	-.028	.028	.117	.067	.024
	Wireman Skills	.064	1.000	.095	.011	.005	.197	-.129	-.029	-.008	-.011	.100	-.020	.069	.115	.024	-.048
	Electrician	.113	.095	1.000	.032	.107	.172	.043	.150	.014	.132	.174	.158	.079	.153	.106	-.005
	Operating Skills PLC System	.089	.011	.032	1.000	.027	-.048	.025	-.058	.063	.008	.042	.063	-.005	.022	.044	.110
	Surveyors Skills	.014	.005	.107	.027	1.000	.089	.099	.020	.011	-.020	.027	-.031	-.040	.073	.002	-.017
	Crane Operating Skills	.121	.197	.172	-.048	.089	1.000	.132	.154	-.029	-.044	.311	.086	.074	.205	.091	-.011
	Plumbing Skills	-.022	-.129	.043	.025	.099	.132	1.000	.151	.085	-.068	.130	-.018	.023	.158	.035	.122
	Foundry man	.092	-.029	.150	-.058	.020	.154	.151	1.000	.044	.043	.143	.084	-.011	.082	.082	.109
	Carpenters Skills	.088	-.008	.014	.063	.011	-.029	.085	.044	1.000	-.025	.020	.083	.127	.080	-.006	.076
	Sheet Metal Worker	-.009	-.011	.132	.008	-.020	-.044	-.068	.043	-.025	1.000	.032	.024	-.036	-.066	.064	.009
	Welding Skills	.065	.100	.174	.042	.027	.311	.130	.143	.020	.032	1.000	.002	.072	.184	.067	.107
	Masonry	-.028	-.020	.158	.063	-.031	.086	-.018	.084	.083	.024	.002	1.000	.123	.036	.045	-.081
	Gas Cutter	.028	.069	.079	-.005	-.040	.074	.023	-.011	.127	-.036	.072	.123	1.000	.058	.096	-.063
	Refrigeration and Air-Conditioning Mechanic	.117	.115	.153	.022	.073	.205	.158	.082	.080	-.066	.184	.036	.058	1.000	.101	.050
	Draughtsman Civil Skills	.067	.024	.106	.044	.002	.091	.035	.082	-.006	.064	.067	.045	.096	.101	1.000	.059
	Draughtsman Mechanical	.024	-.048	-.005	.110	-.017	-.011	.122	.109	.076	.009	.107	-.081	-.063	.050	.059	1.000
Sig. (1-tailed)	Lineman Skills		.095	.010	.033	.384	.006	.327	.028	.035	.426	.090	.281	.286	.008	.083	.311
	Wireman Skills	.095		.025	.414	.457	.000	.004	.274	.438	.408	.020	.343	.078	.009	.312	.160
	Electrician	.010	.025		.254	.013	.000	.191	.001	.388	.003	.000	.001	.052	.001	.014	.459
	Operating Skills PLC System	.033	.414	.254		.290	.161	.304	.117	.096	.436	.194	.096	.458	.325	.184	.012
	Surveyors Skills	.384	.457	.013	.290		.033	.021	.340	.414	.337	.290	.259	.203	.067	.486	.367
	Crane Operating Skills	.006	.000	.000	.161	.033		.003	.001	.277	.185	.000	.038	.064	.000	.030	.413
	Plumbing Skills	.327	.004	.191	.304	.021	.003		.001	.040	.080	.004	.355	.320	.001	.239	.006
	Foundry-man	.028	.274	.001	.117	.340	.001	.001		.185	.189	.002	.041	.410	.046	.046	.013
	Carpenters Skills	.035	.438	.388	.096	.414	.277	.040	.185		.305	.341	.043	.004	.049	.450	.060
	Sheet Metal Worker	.426	.408	.003	.436	.337	.185	.080	.189	.305		.257	.310	.231	.088	.095	.423
	Welding Skills	.090	.020	.000	.194	.290	.000	.004	.002	.341	.257		.484	.069	.000	.083	.014
	Masonry	.281	.343	.001	.096	.259	.038	.355	.041	.043	.310	.484		.006	.228	.176	.048
	Gas-Cutter	.286	.078	.052	.458	.203	.064	.320	.410	.004	.231	.069	.006		.115	.024	.097
	Refrigeration and Air-Conditioning Mechanic	.008	.009	.001	.325	.067	.000	.001	.046	.049	.088	.000	.228	.115		.019	.154
	Draughtsman Civil Skills	.083	.312	.014	.184	.486	.030	.239	.046	.450	.095	.083	.176	.024	.019		.113
	Draughtsman Mechanical	.311	.160	.459	.012	.367	.413	.006	.013	.060	.423	.014	.048	.097	.154	.113	
a. Determinant = .460																	

4.6.5.1 Reliability, Validity & Internal Consistency - De-Silting Tank

Table 4.20 - Reliability, Validity & Internal Consistency - De-Silting Tank				
Civil Activity 5	**KMO and Bartlett's Test**			**Reliability Statistics**
De-Silting Tank	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.620	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	324.881	.875
		Df	120	
		Sig.	.000	

In the table 4.20, (i) Cronbachs Alpha is 0.875, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.6.5.2 Total Variance - De-Silting Tank

Table 4.21: Total Variance Explained - De-Silting Tank									
	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.042	12.760	12.760	2.042	12.760	12.760	1.827	11.419	11.419
2	1.340	8.372	21.132	1.340	8.372	21.132	1.340	8.377	19.796
3	1.235	7.716	28.848	1.235	7.716	28.848	1.277	7.980	27.776
4	1.184	7.400	36.249	1.184	7.400	36.249	1.256	7.852	35.629
5	1.144	7.152	43.401	1.144	7.152	43.401	1.218	7.616	43.244
6	1.052	6.576	49.976	1.052	6.576	49.976	1.077	6.732	49.976
7	.981	6.133	56.109						
8	.956	5.973	62.083						
9	.923	5.770	67.853						
10	.844	5.275	73.128						
11	.829	5.178	78.307						
12	.767	4.794	83.101						

13	.738	4.612	87.713						
14	.696	4.348	92.061						
Extraction Method: Principal Component Analysis.									

Explanation of the total variance is done with help of the initial 8 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 8 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Civil Activity – 5 - De-Silting Tank

4.6.5.3 Rotated Component Matrix - De-Silting Tank

Table 4.22: Rotated Component Matrix - De-Silting Tank

	Component					
	1	2	3	4	5	6
Crane Operating Skills	.719					
Welding Skills	.612					
Refrigeration and Air-Conditioning Mechanic	.534					
Plumbing Skills		.680				
Wireman Skills	.461	-.574				
Foundry man		.464				
Draughtsman Mechanical		.449				
Masonry			.669			
Gas-Cutter			.649			
Carpenters Skills			.458		.411	
Sheet Metal Worker				.724		
Electrician				.533		
Draughtsman Civil Skills						
Operating Skills PLC System					.728	
Lineman Skills					.484	
Surveyors Skills						.821
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]						
a. Rotation converged in 7 iterations.						

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called ‘Component’. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.6.6 Civil Activity 6- Construction of Tunnel

Table 4.23: Correlation Matrix - Construction of Tunnel

Correlation Matrix[a]														
		Electrician	Operating Skills PLC System	Surveyors Skills	Crane Operating Skills	Lineman Skills	Wireman Skills	Plumbing Skills	Foundry man	Carpenters Skills	Sheet Metal Worker	Welding Skills	Masonry	Gas Cutter	Draughtsman Civil Skills
Correlation	Electrician	1.000	.032	.107	.172	.113	.095	.043	.150	.014	.132	.174	.158	.079	.106
	Operating Skills PLC System	.032	1.000	.027	-.048	.089	.011	.025	-.058	.063	.008	.042	.063	-.005	.044
	Surveyors Skills	.107	.027	1.000	.089	.014	.005	.099	.020	.011	-.020	.027	-.031	-.040	.002
	Crane Operating Skills	.172	-.048	.089	1.000	.121	.197	.132	.154	-.029	-.044	.311	.086	.074	.091
	Lineman Skills	.113	.089	.014	.121	1.000	.064	-.022	.092	.088	-.009	.065	-.028	.028	.067
	Wireman Skills	.095	.011	.005	.197	.064	1.000	-.129	-.029	-.008	-.011	.100	-.020	.069	.024
	Plumbing Skills	.043	.025	.099	.132	-.022	-.129	1.000	.151	.085	-.068	.130	-.018	.023	.035
	Foundry man	.150	-.058	.020	.154	.092	-.029	.151	1.000	.044	.043	.143	.084	-.011	.082
	Carpenters Skills	.014	.063	.011	-.029	.088	-.008	.085	.044	1.000	-.025	.020	.083	.127	-.006
	Sheet Metal Worker	.132	.008	-.020	-.044	-.009	-.011	-.068	.043	-.025	1.000	.032	.024	-.036	.064
	Welding Skills	.174	.042	.027	.311	.065	.100	.130	.143	.020	.032	1.000	.002	.072	.067
	Masonry	.158	.063	-.031	.086	-.028	-.020	-.018	.084	.083	.024	.002	1.000	.123	.045
	Gas Cutter	.079	-.005	-.040	.074	.028	.069	.023	-.011	.127	-.036	.072	.123	1.000	.096
	Draughtsman Civil Skills	.106	.044	.002	.091	.067	.024	.035	.082	-.006	.064	.067	.045	.096	1.000
Sig. (1-tailed)	Electrician		.254	.013	.000	.010	.025	.191	.001	.388	.003	.000	.001	.052	.014
	Operating Skills PLC System	.254		.290	.161	.033	.414	.304	.117	.096	.436	.194	.096	.458	.184
	Surveyors Skills	.013	.290		.033	.384	.457	.021	.340	.414	.337	.290	.259	.203	.486
	Crane Operating Skills	.000	.161	.033		.006	.000	.003	.001	.277	.185	.000	.038	.064	.030
	Lineman Skills	.010	.033	.384	.006		.095	.327	.028	.035	.426	.090	.281	.286	.083
	Wireman Skills	.025	.414	.457	.000	.095		.004	.274	.438	.408	.020	.343	.078	.312
	Plumbing Skills	.191	.304	.021	.003	.327	.004		.001	.040	.080	.004	.355	.320	.239
	Foundry man	.001	.117	.340	.001	.028	.274	.001		.185	.189	.002	.041	.410	.046
	Carpenters Skills	.388	.096	.414	.277	.035	.438	.040	.185		.305	.341	.043	.004	.450
	Sheet Metal Worker	.003	.436	.337	.185	.426	.408	.080	.189	.305		.257	.310	.231	.095
	Welding Skills	.000	.194	.290	.000	.090	.020	.004	.002	.341	.257		.484	.069	.083
	Masonry	.001	.096	.259	.038	.281	.343	.355	.041	.043	.310	.484		.006	.176
	Gas Cutter	.052	.458	.203	.064	.286	.078	.320	.410	.004	.231	.069	.006		.024
	Draughtsman Civil Skills	.014	.184	.486	.030	.083	.312	.239	.046	.450	.095	.083	.176	.024	
a. Determinant = .554															

4.6.6.1 Reliability, Validity & Internal Consistency - Construction of Tunnel

Table 4.24: Reliability, Validity & Internal Consistency - Construction of Tunnel				
Civil Activity 6	**KMO and Bartlett's Test**			**Reliability Statistics**
Construction of Tunnel	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.584	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	247.052	.633
		Df	91	
		Sig.	.000	

In the table 4.24, (i) Cronbachs Alpha is 0.633, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.6.6.2 Total Variance - Construction of Tunnel

Table 4.25: Total Variance - Construction of Tunnel						
	Initial Eigen values			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.862	13.300	13.300	1.862	13.300	13.300
2	1.245	8.896	22.195	1.245	8.896	22.195
3	1.226	8.755	30.951	1.226	8.755	30.951
4	1.155	8.250	39.200	1.155	8.250	39.200
5	1.097	7.834	47.034	1.097	7.834	47.034
6	1.011	7.223	54.256	1.011	7.223	54.256
7	.971	6.935	61.192			
8	.939	6.707	67.899			
9	.918	6.555	74.454			
10	.810	5.787	80.241			
11	.746	5.325	85.566			
12	.722	5.161	90.727			

13	.716	5.113	95.840			
14	.582	4.160	100.000			
Extraction Method: Principal Component Analysis.						

Explanation of the total variance is done with help of the initial 7 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 7 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Civil Activity 6- Construction of Tunnel.

4.6.6.3 Rotated Component Matrix - Construction of Tunnel

Table 4.26: Rotated Component Matrix - Construction of Tunnel

	Component					
	1	2	3	4	5	6
Crane Operating Skills	.763					
Welding Skills	.624					
Plumbing Skills		.693				
Wireman Skills	.468	-.621				
Foundry man		.531				
Masonry			.689			
Gas Cutter			.671			
Sheet Metal Worker				.736		
Electrician				.530		
Draughtsman Civil Skills						
Lineman Skills					.722	
Operating Skills PLC System					.600	
Carpenters Skills			.442		.447	
Surveyors Skills						.795
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]						
a. Rotation converged in 7 iterations.						

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called ‘Component’. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.6.7 Civil Activity 7- Construction of Power Channel

Table 4.27: Correlation Matrix - Construction of Power Channel

Correlation Matrix[a]																					
		Lineman Skills	Wireman Skills	Plumbing Skills	Foundry man	Carpenters Skills	Sheet Metal Worker	Welding Skills	Masonry	Gas-Cutter	Electrician	Surveyors Skills	Fitters Skills	Turner Skills	Crane Mechanic	Draughtsman Civil Skills	Draughtsman Mechanical	Painting Skills	Storekeeper	Housekeeper	Crane Operating Skills
Correlation	Lineman Skills	1.000	.064	-.022	.092	.088	-.009	.065	-.028	.028	.113	.014	.126	.134	.143	.067	.024	.128	-.007	.063	.121
	Wireman Skills	.064	1.000	-.129	-.029	-.008	-.011	.100	-.020	.069	.095	.005	-.008	.092	-.017	.024	-.048	.249	-.045	-.017	.197
	Plumbing Skills	-.022	-.129	1.000	.151	.085	-.068	.130	-.018	.023	.043	.099	.035	.027	.021	.035	.122	-.169	-.082	.046	.132
	Foundry man	.092	-.029	.151	1.000	.044	.043	.143	.084	-.011	.150	.020	-.032	.052	.080	.082	.109	-.027	-.071	.059	.154
	Carpenters Skills	.088	-.008	.085	.044	1.000	-.025	.020	.083	.127	.014	.011	.125	.052	.193	-.006	.076	.073	.006	.131	-.029
	Sheet Metal Worker	-.009	-.011	-.068	.043	-.025	1.000	.032	.024	-.036	.132	-.020	.046	.006	-.064	.064	.009	.006	-.005	.059	-.044
	Welding Skills	.065	.100	.130	.143	.020	.032	1.000	.002	.072	.174	.027	-.105	.137	.027	.067	.107	.012	-.190	.093	.311
	Masonry	-.028	-.020	-.018	.084	.083	.024	.002	1.000	.123	.158	-.031	-.025	.003	.024	.045	-.081	-.050	.006	-.029	.086
	Gas-Cutter	.028	.069	.023	-.011	.127	-.036	.072	.123	1.000	.079	-.040	.011	-.008	.086	.096	-.063	.034	.046	-.019	.074
	Electrician	.113	.095	.043	.150	.014	.132	.174	.158	.079	1.000	.107	.026	.045	.010	.106	-.005	.037	-.057	.081	.172
	Surveyors Skills	.014	.005	.099	.020	.011	-.020	.027	-.031	-.040	.107	1.000	-.092	.016	.052	.002	-.017	-.103	.016	.002	.089
	Fitters Skills	.126	-.008	.035	-.032	.125	.046	-.105	-.025	.011	.026	-.092	1.000	.042	.021	.058	-.039	.086	.123	.049	-.147
	Turner Skills	.134	.092	.027	.052	.052	.006	.137	.003	-.008	.045	.016	.042	1.000	.012	.031	-.005	.112	.023	.021	.119
	Crane Mechanic	.143	-.017	.021	.080	.193	-.064	.027	.024	.086	.010	.052	.021	.012	1.000	-.038	.094	-.062	.021	.127	-.102
	Draughtsman Civil Skills	.067	.024	.035	.082	-.006	.064	.067	.045	.096	.106	.002	.058	.031	-.038	1.000	.059	.082	.026	.059	.091
	Draughtsman Mechanical	.024	-.048	.122	.109	.076	.009	.107	-.081	-.063	-.005	-.017	-.039	-.005	.094	.059	1.000	.015	-.031	.136	-.011
	Painting Skills	.128	.249	-.169	-.027	.073	.006	.012	-.050	.034	.037	-.103	.086	.112	-.062	.082	.015	1.000	.096	.034	.032
	Storekeeper	-.007	-.045	-.082	-.071	.006	-.005	-.190	.006	.046	-.057	.016	.123	.023	.021	.026	-.031	.096	1.000	-.098	-.184
	Housekeeper	.063	-.017	.046	.059	.131	.059	.093	-.029	-.019	.081	.002	.049	.021	.127	.059	.136	.034	-.098	1.000	.005
	Crane Operating Skills	.121	.197	.132	.154	-.029	-.044	.311	.086	.074	.172	.089	-.147	.119	-.102	.091	-.011	.032	-.184	.005	1.000
Sig. (1-tailed)	Lineman Skills		.095	.327	.028	.035	.426	.090	.281	.286	.010	.384	.005	.003	.002	.083	.311	.004	.443	.098	.006
	Wireman Skills	.095		.004	.274	.438	.408	.020	.343	.078	.025	.457	.434	.028	.363	.312	.160	.000	.175	.363	.000
	Plumbing Skills	.327	.004		.001	.040	.080	.004	.355	.320	.191	.021	.236	.289	.331	.239	.006	.000	.046	.174	.003
	Foundry man	.028	.274	.001		.185	.189	.002	.041	.410	.001	.340	.254	.142	.050	.046	.013	.289	.071	.113	.001
	Carpenters Skills	.035	.438	.040	.185		.305	.341	.043	.004	.388	.414	.005	.145	.000	.450	.060	.066	.452	.004	.277
	Sheet Metal Worker	.426	.408	.080	.189	.305		.257	.310	.231	.003	.337	.171	.447	.094	.095	.423	.454	.462	.111	.185
	Welding Skills	.090	.020	.004	.002	.341	.257		.484	.069	.000	.290	.016	.002	.292	.083	.014	.404	.000	.027	.000
	Masonry	.281	.343	.355	.041	.043	.310	.484		.006	.001	.259	.305	.478	.309	.176	.048	.150	.452	.277	.038
	Gas-Cutter	.286	.078	.320	.410	.004	.231	.069	.006		.052	.203	.414	.437	.037	.024	.097	.245	.173	.351	.064
	Electrician	.010	.025	.191	.001	.388	.003	.000	.001	.052		.013	.298	.177	.422	.014	.459	.223	.121	.048	.000
	Surveyors Skills	.384	.457	.021	.340	.414	.337	.290	.259	.203	.013		.029	.372	.141	.486	.367	.017	.372	.486	.033
	Fitters Skills	.005	.434	.236	.254	.005	.171	.016	.305	.414	.298	.029		.193	.333	.117	.209	.038	.006	.155	.001
	Turner Skills	.003	.028	.289	.142	.145	.447	.002	.478	.437	.177	.372	.193		.401	.263	.458	.010	.317	.336	.007
	Crane Mechanic	.002	.363	.331	.050	.000	.094	.292	.309	.037	.422	.141	.333	.401		.219	.026	.101	.330	.004	.018
	Storekeeper	.443	.175	.046	.071	.452	.462	.000	.452	.173	.121	.372	.006	.317	.330	.294	.264	.023		.022	.000
	Housekeeper	.098	.363	.174	.113	.004	.111	.027	.277	.351	.048	.486	.155	.336	.004	.113	.002	.245	.022		.462
	Crane Operating Skills	.006	.000	.003	.001	.277	.185	.000	.038	.064	.000	.033	.001	.007	.018	.030	.413	.255	.000	.462	

a. Determinant = .314

4.6.7.1 Reliability, Validity & Internal Consistency - Construction of Power Channel

Table 4.28: Reliability, Validity & Internal Consistency - Construction of Power Channel				
Civil Activity 7	**KMO and Bartlett's Test**			**Reliability Statistics**
Construction of Power Channel	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.606	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	482.875	.896
		Df	190	
		Sig.	.000	

In the table 4.28, (i) Cronbachs Alpha is 0.896, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.6.7.2 - Total Variance - Construction of Power Channel

Table 4.29: Total Variance - Construction of Power Channel									
	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.027	10.136	10.136	2.027	10.136	10.136	1.820	9.099	9.099
2	1.587	7.935	18.071	1.587	7.935	18.071	1.448	7.240	16.340
3	1.530	7.650	25.721	1.530	7.650	25.721	1.426	7.129	23.469
4	1.282	6.411	32.132	1.282	6.411	32.132	1.315	6.576	30.045
5	1.215	6.073	38.204	1.215	6.073	38.204	1.292	6.458	36.503
6	1.108	5.539	43.743	1.108	5.539	43.743	1.204	6.022	42.525
7	1.069	5.345	49.089	1.069	5.345	49.089	1.189	5.947	48.472
8	1.004	5.021	54.109	1.004	5.021	54.109	1.127	5.637	54.109
9	.968	4.842	58.952						
10	.925	4.627	63.579						
11	.883	4.413	67.992						
12	.855	4.277	72.269						
13	.789	3.945	76.214						
14	.778	3.891	80.105						

15	.756	3.778	83.883						
16	.699	3.497	87.380						
17	.689	3.446	90.826						
Extraction Method: Principal Component Analysis.									

Explanation of the total variance is done with help of the initial 10 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 10 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Civil Activity 7- Construction of Power Channel

4.6.7.3 Rotated Component Matrix - Construction of Power Channel

Table 4.30: Rotated Component Matrix - Construction of Power Channel

	Component							
	1	2	3	4	5	6	7	8
Crane Operating Skills	.683							
Welding Skills	.668							
Storekeeper	-.588							
Foundry man								
Crane Mechanic		.720						
Carpenters Skills		.613						
Housekeeper		.497						
Wireman Skills			.663					
Plumbing Skills			-.635					
Painting Skills			.613					
Turner Skills				.626				
Lineman Skills				.590				
Fitters Skills				.529				
Masonry					.709			
Gas Cutter					.522			
Draughtsman Mechanical					-.513			
Sheet Metal Worker						.751		
Electrician						.485		

Draughtsman Civil Skills							.761	
Surveyors Skills								.871
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]								
a. Rotation converged in 13 iterations.								

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors. The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.6.8 Task A (Civil Works) – Results

Anexhaustive analysis was conducted in order to discern the activity wise significant skill gaps. To achieve this mentioned aim, analysis was conducted with help of Spss 21 version was used. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cutoff of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent).

Table 4.31: Task A (Civil Works) – Results

Trades	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6	Activity 7
Sheet Metal Worker	0.819				0.724	0.736	0.751
Welding skills	0.769	0.835	0.837	0.795			
Masonry	0.748						
Foundry man	0.804	0.721					
Crane Mechanical works	0.843		1.018				0.720
Gas-Cutter		0.722	1.133	1.152			
Surveyors Skills		0.744	1.112	1.039	0.821	0.795	
Lineman Skills		0.845				0.722	
Construction Machinery Mechanic cum Operator			1.185	1.093			
Crane Operating Skills			0.866	0.895	0.719	0.763	
Plumbing Skills			1.17	0.780			
Electrician			0.979	0.942			
Turner Skills			1.163				
Draughtsman Mechanical				1.069			
Operating Skills PLC System					0.728		

Results of Task 'A' – "Civil Works" as per table 4.31 are:

Activity 1 (Task A) – In activity 1, the researcher deciphers that the study has observed 16 factors out of which only 5 factors are considered significant. Being, (i) Sheet Metal Worker (ii) Welding Skills (iii) Masonry (iv) Foundry man (v) Crane Mechanical Works.

Among these found factors the 'Crane Mechanical Works' is most significant with the value of 0.843.

Activity 2 (Task A) – In activity 2, the researcher deciphers that the study has observed 16 factors among which only 5 factors are considered significant. Being (i) Welding skills (ii) Foundary man (iii) Gas-Cutter (iv) Surveyors Skills (v) Lineman Skills

Among these the 'Lineman Skills' is the most significant with the value of 0.845.

Activity 3 (Task A) – In activity 3, the researcher deciphers that the study has observed 18 factors among which 9 factors are considered significant. Being, (i) Welding Skills (ii) Crane Mechanical Works (iii) Gas-Cutter (iv) Surveyors Skills (v) Construction Machinery Mechanic cum Operator (vi) Crane Operating Skills (vii) Plumbing Skills (viii) Electrician (ix) Turner Skills

Among these the 'Construction Machinery Mechanic cum Operator' is the most significant with the value of 1.185.

Activity 4 (Task A) - In activity 4, the researcher deciphers that the study has observed 17 factors among which 8 factors are considered significant. Being,(i) Welding Skills (ii) Gas-Cutter (iii) Surveyor skills (iv) Construction Machinery Mechanic cum Operator (v) Crane Operating Skills (vi) Plumbing Skills (vii) Electrician (viii) Draughtsman Mechanical Skills

Among these the 'Gas-Cutter' is the most significant with the value of 1.152.

Activity 5 (Task A) **-** In activity 5, the researcher deciphers that the study has observed 16 factors among which only 4 factors are considered significant. Being,(i)Sheet Metal Works (ii) Surveyors Skills (iii) Crane Operating Skills (iv) Operating Skills PLC System

Among these the 'Surveyors Skills' is the most significant with the value of 0.821.

Activity 6 (Task A) **-** In activity 6, the researcher deciphers that the study has observed 14 factors among which only 4 factors are considered significant. Being,(i) Sheet Metal Works (ii) Surveyor Skills (iii) Lineman Skills (iv) Crane Operating Skills

Among these the 'Surveyors Skills' is the most significant with the value of 0.795.

Activity 7 (Task A) **-** In activity 7, the researcher deciphers that the study has observed 20 factors among which only 3 factors are considered significant. Being,(i) Sheet Metal Works (ii) Crane Mechanical Works (iii) Draughtsman Civil Skills

Among these the 'Draughtsman Civil Skills' is the most significant with the value of 0.761.

4.7 Task B - Electro- Mechanical Works

While civil engineering components deals with passage of water from head works (intake) to a powerhouse via water conveyance structures, electro mechanical works facilitate the conversion of mechanical engineering into electrical energy. Task Electro-Mechanical works have four activities under its head: (i) Construction of Power House (ii) Construction of Protection wall (iii) Construction of Tail Race Channel (iv) Construction of Switchyard

Respondents were questioned about significant skills sets required in Electro-Mechanical Activity Areas, (i) Correlation Matrix (ii) Reliability; Validity & Internal Consistency (iii) Total Variance (iv) Rotated Component Matrix, are as below-

4.7.1 Electro- Mechanical Activity 1- Construction of Power House

Table 4.32: Correlation Matrix - Construction of Power House

Correlation Matrix[a]													
		Plumbing Skills	Lineman Skills	Wireman Skills	Welding Skills	Masonry	Sheet Metal Worker	Electrician	Construction Machinery Mechanic cum Operator	Draughtsman Civil Skills	Surveyors Skills	Foundry man	Carpenters Skills	Gas-Cutter
Correlation	Plumbing Skills	1.000	.090	.003	.083	.050	.009	-.037	-.060	-.007	.003	.074	.069	-.023
	Lineman Skills	.090	1.000	.063	-.008	-.040	.012	-.021	.018	-.022	.072	-.043	.120	.077
	Wireman Skills	.003	.063	1.000	.028	-.081	.039	.041	-.020	.029	.071	.024	.014	.020
	Welding Skills	.083	-.008	.028	1.000	-.032	-.060	.159	.080	.076	.002	.110	.026	.052
	Masonry	.050	-.040	-.081	-.032	1.000	-.024	.016	-.045	.004	-.021	.038	.166	.032
	Sheet Metal Worker	.009	.012	.039	-.060	-.024	1.000	.061	-.044	.009	-.071	-.049	-.088	-.022
	Electrician	-.037	-.021	.041	.159	.016	.061	1.000	.013	.107	.028	.087	-.030	.093
	Construction Machinery Mechanic cum Operator	-.060	.018	-.020	.080	-.045	-.044	.013	1.000	-.006	-.011	.079	.000	-.061
	Draughtsman Civil Skills	-.007	-.022	.029	.076	.004	.009	.107	-.006	1.000	-.018	.062	-.103	.051
	Surveyors Skills	.003	.072	.071	.002	-.021	-.071	.028	-.011	-.018	1.000	.059	.042	-.087
	Foundry man	.074	-.043	.024	.110	.038	-.049	.087	.079	.062	.059	1.000	.044	-.011
	Carpenters Skills	.069	.120	.014	.026	.166	-.088	-.030	.000	-.103	.042	.044	1.000	.127
	Gas Cutter	-.023	.077	.020	.052	.032	-.022	.093	-.061	.051	-.087	-.011	.127	1.000
Sig. (1-tailed)	Plumbing Skills		.031	.479	.044	.153	.424	.226	.108	.443	.478	.063	.079	.317
	Lineman Skills	.031		.096	.436	.203	.404	.330	.354	.328	.069	.188	.007	.055
	Wireman Skills	.479	.096		.279	.048	.213	.198	.343	.274	.073	.309	.385	.341
	Welding Skills	.044	.436	.279		.253	.110	.000	.050	.059	.487	.012	.297	.144
	Masonry	.153	.203	.048	.253		.308	.368	.176	.464	.334	.216	.000	.256
	Sheet Metal Worker	.424	.404	.213	.110	.308		.106	.182	.423	.071	.159	.035	.327
	Electrician	.226	.330	.198	.000	.368	.106		.395	.014	.284	.037	.269	.028
	Construction Machinery Mechanic cum Operator	.108	.354	.343	.050	.176	.182	.395		.448	.411	.051	.499	.105
	Draughtsman Civil Skills	.443	.328	.274	.059	.464	.423	.014	.448		.354	.100	.017	.148
	Surveyors Skills	.478	.069	.073	.487	.334	.071	.284	.411	.354		.114	.195	.037
	Foundry man	.063	.188	.309	.012	.216	.159	.037	.051	.100	.114		.185	.410
	Carpenters Skills	.079	.007	.385	.297	.000	.035	.269	.499	.017	.195	.185		.004
	Gas-Cutter	.317	.055	.341	.144	.256	.327	.028	.105	.148	.037	.410	.004	
a. Determinant = .752														

4.7.1.1 Reliability, Validity & Internal Consistency - Construction of Power House

Table 4.33: Reliability, Validity & Internal Consistency – Construction of Power House				
Electro Activity 1	KMO and Bartlett's Test			Reliability Statistics
Construction of Power House	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.509	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	119.362	.695
		Df	78	
		Sig.	.002	

In the table 4.33, (i) Cronbachs Alpha is 0.695, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.7.1.2 Total Variance - Construction of Power House

Table 4.34: Total Variance Explained - Construction of Power House									
	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.375	10.578	10.578	1.375	10.578	10.578	1.315	10.112	10.112
2	1.328	10.213	20.791	1.328	10.213	20.791	1.297	9.974	20.086
3	1.187	9.134	29.926	1.187	9.134	29.926	1.167	8.974	29.060
4	1.173	9.019	38.945	1.173	9.019	38.945	1.149	8.837	37.897
5	1.068	8.216	47.161	1.068	8.216	47.161	1.121	8.620	46.517
6	1.026	7.891	55.052	1.026	7.891	55.052	1.110	8.535	55.052
7	.967	7.439	62.490						

8	.919	7.072	69.563						
9	.910	6.999	76.562						
10	.845	6.502	83.063						
11	.758	5.831	88.895						
Extraction Method: Principal Component Analysis.									

Explanation of the total variance is done with help of the initial 7 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 7 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Electro- Mechanical Activity 1- Construction of Power House

4.7.1.3 Rotated Component Matrix - Construction of Power House

Table 4.35: Rotated Component Matrix - Construction of Power House

	Component					
	1	2	3	4	5	6
Plumbing Skills						.859
Lineman Skills			.679			
Wireman Skills			.519			
Welding Skills	.447			.452		
Masonry		.513	-.475			
Sheet Metal Worker						
Electrician	.689					
Construction Machinery Mechanic cum Operator				.770		
Draughtsman Civil Skills	.563					
Surveyors Skills					.816	
Foundry man						
Carpenters Skills		.732				
Gas-Cutter		.509				

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 11 iterations.

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called ‘Component’. Rest of the sub columns help in identification of the factors. The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent).

4.7.2 Electro- Mechanical Activity 2 - Construction of Protection wall

Table 4.36: Correlation Matrix - Construction of Protection wall

Correlation Matrix[a]																					
		Plumbing Skills	Lineman Skills	Wireman Skills	Welding Skills	Masonry	Sheet Metal Worker	Electrician	Construction Machinery Mechanic cum Operator	Draughtsman Civil Skills	Surveyors Skills	Foundry man	Carpenters Skills	Gas-Cutter	Draughtsman Mechanical	Painting Skills	Fitters Skills	Turner Skills	Storekeeper	Housekeeper	Crane Operating Skills
Correlation	Plumbing Skills	1.000	-.022	-.069	.130	-.018	-.068	.043	.181	.035	.099	.151	.085	.003	.122	-.169	.035	.027	-.082	.046	.132
	Lineman Skills	-.022	1.000	.032	.065	-.028	-.009	.113	.003	.067	.014	.092	.088	.040	.024	.128	.126	.134	-.007	.063	.121
	Wireman Skills	-.069	.032	1.000	.075	.055	-.042	.024	-.039	-.056	-.023	-.018	-.009	.034	-.047	.144	.041	.041	-.034	-.042	.093
	Welding Skills	.130	.065	.075	1.000	.002	.032	.174	.065	.067	.027	.143	.020	.065	.107	.012	-.105	.137	-.190	.093	.311
	Masonry	-.018	-.028	.055	.002	1.000	.024	.158	.062	.045	-.031	.084	.083	.139	-.081	-.050	-.025	.003	.006	-.029	.086
	Sheet Metal Worker	-.068	-.009	-.042	.032	.024	1.000	.132	-.005	.064	-.020	.043	-.025	.010	.009	.006	.046	.006	-.005	.059	-.044
	Electrician	.043	.113	.024	.174	.158	.132	1.000	.055	.106	.107	.150	.014	.063	-.005	.037	.026	.045	-.057	.081	.172
	Construction Machinery Mechanic cum Operator	.181	.003	-.039	.065	.062	-.005	.055	1.000	-.005	.072	.031	.035	.001	.018	-.009	-.086	-.015	-.062	.019	.194
	Draughtsman Civil Skills	.035	.067	-.056	.067	.045	.064	.106	-.005	1.000	.002	.082	-.006	.124	.059	.082	.058	.031	.026	.059	.091
	Surveyors Skills	.099	.014	-.023	.027	-.031	-.020	.107	.072	.002	1.000	.020	.011	-.013	-.017	-.103	-.092	.016	.016	.002	.089
	Foundry man	.151	.092	-.018	.143	.084	.043	.150	.031	.082	.020	1.000	.044	-.017	.109	-.027	-.032	.052	-.071	.059	.154
	Carpenters Skills	.085	.088	-.009	.020	.083	-.025	.014	.035	-.006	.011	.044	1.000	.065	.076	.073	.125	.052	.006	.131	-.029
	Gas Cutter	.003	.040	.034	.065	.139	.010	.063	.001	.124	-.013	-.017	.065	1.000	.032	.053	.028	.026	.095	.002	.071
	Draughtsman Mechanical	.122	.024	-.047	.107	-.081	.009	-.005	.018	.059	-.017	.109	.076	.032	1.000	.015	-.039	-.005	-.031	.136	-.011
	Painting Skills	-.169	.128	.144	.012	-.050	.006	.037	-.009	.082	-.103	-.027	.073	.053	.015	1.000	.086	.112	.096	.034	.032
	Fitters Skills	.035	.126	.041	-.105	-.025	.046	.026	-.086	.058	-.092	-.032	.125	.028	-.039	.086	1.000	.042	.123	.049	-.147
	Housekeeper	.046	.063	-.042	.093	-.029	.059	.081	.019	.059	.002	.059	.131	.002	.136	.034	.049	.021	-.098	1.000	.005
	Crane Operating Skills	.132	.121	.093	.311	.086	-.044	.172	.194	.091	.089	.154	-.029	.071	-.011	.032	-.147	.119	-.184	.005	1.000
Sig. (1-tailed)	Plumbing Skills		.327	.077	.004	.355	.080	.191	.000	.239	.021	.001	.040	.478	.006	.000	.236	.289	.046	.174	.003
	Lineman Skills	.327		.253	.090	.281	.426	.010	.474	.083	.384	.028	.035	.206	.311	.004	.005	.003	.443	.098	.006
	Wireman Skills	.077	.253		.061	.128	.193	.308	.213	.127	.318	.352	.429	.240	.167	.001	.202	.202	.244	.195	.027
	Welding Skills	.004	.090	.061		.484	.257	.000	.090	.083	.290	.002	.341	.090	.014	.404	.016	.002	.000	.027	.000
	Masonry	.355	.281	.128	.484		.310	.001	.102	.176	.259	.041	.043	.002	.048	.150	.305	.478	.452	.277	.038
	Sheet Metal Worker	.080	.426	.193	.257	.310		.003	.457	.095	.337	.189	.305	.415	.423	.454	.171	.447	.462	.111	.185
	Electrician	.191	.010	.308	.000	.001	.003		.130	.014	.013	.001	.388	.096	.459	.223	.298	.177	.121	.048	.000
	Construction Machinery Mechanic cum Operator	.000	.474	.213	.090	.102	.457	.130		.463	.070	.260	.233	.490	.355	.430	.039	.377	.103	.348	.000
	Draughtsman Civil Skills	.239	.083	.127	.083	.176	.095	.014	.463		.486	.046	.450	.005	.113	.046	.117	.263	.294	.113	.030
	Surveyors Skills	.021	.384	.318	.290	.259	.337	.013	.070	.486		.340	.414	.396	.367	.017	.029	.372	.372	.486	.033
	Foundry man	.001	.028	.352	.002	.041	.189	.001	.260	.046	.340		.185	.362	.013	.289	.254	.142	.071	.113	.001
	Carpenters Skills	.040	.035	.429	.341	.043	.305	.388	.233	.450	.414	.185		.090	.060	.066	.005	.145	.452	.004	.277
	Gas-Cutter	.478	.206	.240	.090	.002	.415	.096	.490	.005	.396	.362	.090		.258	.140	.282	.300	.025	.486	.072
	Draughtsman Mechanical	.006	.311	.167	.014	.048	.423	.459	.355	.113	.367	.013	.060	.258		.380	.209	.458	.264	.002	.413
	Painting Skills	.000	.004	.001	.404	.150	.454	.223	.430	.046	.017	.289	.066	.140	.380		.038	.010	.023	.245	.255
	Fitters Skills	.236	.005	.202	.016	.305	.171	.298	.039	.117	.029	.254	.005	.282	.209	.038		.193	.006	.155	.001
	Housekeeper	.174	.098	.195	.027	.277	.111	.048	.348	.113	.486	.113	.004	.486	.002	.245	.155	.336	.022		.462
	Crane Operating Skills	.003	.006	.027	.000	.038	.185	.000	.000	.030	.033	.001	.277	.072	.413	.255	.001	.007	.000	.462	
a. Determinant = .354																					

4.7.2.1 Reliability, Validity & Internal Consistency - Construction of Protection wall

Table 4.37: Reliability, Validity & Internal Consistency - Construction of Protection wall				
Electro Activity 2	KMO and Bartlett's Test			Reliability Statistics
Construction of Protection wall	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.610	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	432.106	.819
		Df	190	
		Sig.	.000	

In the table 4.37, (i) Cronbachs Alpha is 0.819, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.7.2.2 Total Variance - Construction of Protection wall

Table 4.38: Total Variance - Construction of Protection wall									
	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.045	10.223	10.223	2.045	10.223	10.223	1.677	8.385	8.385
2	1.586	7.932	18.155	1.586	7.932	18.155	1.437	7.185	15.570
3	1.360	6.800	24.955	1.360	6.800	24.955	1.429	7.147	22.717
4	1.256	6.278	31.233	1.256	6.278	31.233	1.358	6.788	29.505
5	1.178	5.889	37.122	1.178	5.889	37.122	1.263	6.317	35.822
6	1.095	5.474	42.596	1.095	5.474	42.596	1.225	6.127	41.949
7	1.075	5.376	47.971	1.075	5.376	47.971	1.205	6.023	47.971
8	.995	4.976	52.948						
9	.963	4.813	57.760						
10	.928	4.639	62.400						
11	.922	4.610	67.010						
12	.914	4.568	71.578						
13	.841	4.203	75.781						
14	.788	3.942	79.722						

15	.761	3.805	83.527						
16	.749	3.746	87.273						
17	.687	3.436	90.709						
18	.636	3.180	93.890						
19	.623	3.113	97.003						
Extraction Method: Principal Component Analysis.									

Explanation of the total variance is done with help of the initial 10 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 10 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Electro- Mechanical Activity 2 - Construction of Protection wall

4.7.2.3 Rotated Component Matrix - Construction of Protection wall

Table 4.39: Rotated Component Matrix - Construction of Protection wall

	Component						
	1	2	3	4	5	6	7
Plumbing Skills			.654				
Lineman Skills		.638					
Wireman Skills							
Welding Skills	.636						
Masonry						.741	
Sheet Metal Worker					.676		
Electrician					.608		
Construction Machinery Mechanic cum Operator			.439				
Draughtsman Civil Skills							.624
Surveyors Skills			.551				
Foundry man							
Carpenters Skills				.488		.426	
Gas-Cutter							.661
Draughtsman Mechanical				.583			
Painting Skills		.475	-.437				
Fitters Skills	-.513						
Turner Skills		.561					

Storekeeper	-.516						.416
Housekeeper				.604			
Crane Operating Skills	.658						
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]							
a. Rotation converged in 17 iterations.							

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.7.3 Electro- Mechanical Activity 3 - Construction of Tail Race Channel

Table 4.40: Correlation Matrix - Construction of Tail Race Channel

Correlation Matrix[a]													
		Plumbing Skills	Lineman Skills	Wireman Skills	Welding Skills	Masonry	Sheet Metal Worker	Electrician	Construction Machinery Mechanic cum Operator	Draughtsman Civil Skills	Surveyors Skills	Carpenters Skills	Gas-Cutter	Foundry man
Correlation	Plumbing Skills	1.000	-.022	-.129	.130	-.020	-.068	.043	.181	.035	.099	.085	.023	.151
	Lineman Skills	-.022	1.000	.064	.065	-.016	-.009	.113	.003	.067	.014	.088	.028	.092
	Wireman Skills	-.129	.064	1.000	.100	-.018	-.011	.095	-.031	.024	.005	-.008	.069	-.029
	Welding Skills	.130	.065	.100	1.000	-.005	.032	.174	.065	.067	.027	.020	.072	.143
	Masonry	-.020	-.016	-.018	-.005	1.000	-.006	.108	.046	.026	-.027	.057	.163	.026
	Sheet Metal Worker	-.068	-.009	-.011	.032	-.006	1.000	.132	-.005	.064	-.020	-.025	-.036	.043
	Electrician	.043	.113	.095	.174	.108	.132	1.000	.055	.106	.107	.014	.079	.150
	Construction Machinery Mechanic cum Operator	.181	.003	-.031	.065	.046	-.005	.055	1.000	-.005	.072	.035	-.020	.031
	Draughtsman Civil Skills	.035	.067	.024	.067	.026	.064	.106	-.005	1.000	.002	-.006	.096	.082
	Surveyors Skills	.099	.014	.005	.027	-.027	-.020	.107	.072	.002	1.000	.011	-.040	.020
	Carpenters Skills	.085	.088	-.008	.020	.057	-.025	.014	.035	-.006	.011	1.000	.127	.044
	Gas Cutter	.023	.028	.069	.072	.163	-.036	.079	-.020	.096	-.040	.127	1.000	-.011
	Foundry man	.151	.092	-.029	.143	.026	.043	.150	.031	.082	.020	.044	-.011	1.000
Sig. (1-tailed)	Plumbing Skills		.327	.004	.004	.340	.080	.191	.000	.239	.021	.040	.320	.001
	Lineman Skills	.327		.095	.090	.370	.426	.010	.474	.083	.384	.035	.286	.028
	Wireman Skills	.004	.095		.020	.354	.408	.025	.262	.312	.457	.438	.078	.274
	Welding Skills	.004	.090	.020		.460	.257	.000	.090	.083	.290	.341	.069	.002
	Masonry	.340	.370	.354	.460		.454	.013	.173	.298	.290	.120	.000	.298
	Sheet Metal Worker	.080	.426	.408	.257	.454		.003	.457	.095	.337	.305	.231	.189
	Electrician	.191	.010	.025	.000	.013	.003		.130	.014	.013	.388	.052	.001
	Construction Machinery Mechanic cum Operator	.000	.474	.262	.090	.173	.457	.130		.463	.070	.233	.344	.260
	Draughtsman Civil Skills	.239	.083	.312	.083	.298	.095	.014	.463		.486	.450	.024	.046
	Surveyors Skills	.021	.384	.457	.290	.290	.337	.013	.070	.486		.414	.203	.340
	Carpenters Skills	.040	.035	.438	.341	.120	.305	.388	.233	.450	.414		.004	.185
	Gas-Cutter	.320	.286	.078	.069	.000	.231	.052	.344	.024	.203	.004		.410
	Foundry man	.001	.028	.274	.002	.298	.189	.001	.260	.046	.340	.185	.410	
a. Determinant = .680														

4.7.3.1 Reliability, Validity & Internal Consistency - Construction of Tail Race Channel

Table 4.41: Reliability, Validity & Internal Consistency – Construction of Tail Race Channel				
Electro Activity 3	KMO and Bartlett's Test			Reliability Statistics
Construction of Tail Race Channel	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.568	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	161.728	.672
		Df	78	
		Sig.	.000	

In the table 4.41, (i) Cronbachs Alpha is 0.672, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.7.3.2 Total Variance – Construction of Tail Race Channel

Table 4.42: Total Variance - Construction of Tail Race Channel									
	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.629	12.529	12.529	1.629	12.529	12.529	1.458	11.213	11.213
2	1.315	10.116	22.645	1.315	10.116	22.645	1.276	9.817	21.030
3	1.209	9.302	31.947	1.209	9.302	31.947	1.217	9.365	30.395
4	1.086	8.350	40.297	1.086	8.350	40.297	1.183	9.098	39.493
5	1.042	8.016	48.313	1.042	8.016	48.313	1.147	8.820	48.313
6	.987	7.594	55.907						
7	.950	7.309	63.217						
8	.916	7.046	70.262						
9	.904	6.955	77.218						
10	.805	6.195	83.413						

11	.748	5.755	89.168						
12	.719	5.529	94.697						
Extraction Method: Principal Component Analysis.									

Explanation of the total variance is done with help of the initial 7 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 7 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Electro-Mechanical Activity 3 - Construction of Tail Race Channel.

4.7.3.3 Rotated Component Matrix - Construction of Tail Race Channel

Table 4.43: Rotated Component Matrix - Construction of Tail Race Channel

	Component				
	1	2	3	4	5
Plumbing Skills		.539			
Lineman Skills	.417				.401
Wireman Skills				.795	
Welding Skills	.446				
Masonry			.761		
Sheet Metal Worker					-.601
Electrician	.508				
Construction Machinery Mechanic cum Operator		.622			
Draughtsman Civil Skills	.473				
Surveyors Skills		.602			
Carpenters Skills					.606
Gas Cutter			.651		
Foundry man	.630				

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 12 iterations.

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.7.4 Electro- Mechanical Activity 4 - Construction of Switchyard

Table 4.44: Correlation Matrix - Construction of Switchyard

Correlation Matrix[a]																		
		Lineman Skills	Wireman Skills	Plumbing Skills	Foundry man	Carpenters Skills	Sheet Metal Worker	Welding Skills	Masonry	Gas Cutter	Electrician	Surveyors Skills	Painting Skills	Fitters Skills	Mechanic	Information Technology and Electronic System Maintenance	Draughtsman Mechanical	Line Operator	Crane Operating Skills
Correlation	Lineman Skills	1.000	.064	-.018	.090	.088	-.009	.065	-.037	.028	.113	.014	.073	.097	-.007	.029	.033	.008	.116
	Wireman Skills	.064	1.000	-.125	-.030	-.008	-.011	.100	-.059	.069	.095	.005	.222	.012	.030	-.100	-.043	-.025	.004
	Plumbing Skills	-.018	-.125	1.000	.149	.086	-.070	.133	.061	.021	.043	.095	-.067	-.012	-.034	.044	.118	.117	.099
	Foundry man	.090	-.030	.149	1.000	.041	.041	.144	.130	-.009	.151	.018	-.049	-.024	.014	.109	.106	.096	.080
	Carpenters Skills	.088	-.008	.086	.041	1.000	-.025	.020	.052	.127	.014	.011	.026	-.070	.122	.095	.074	.021	.042
	Sheet Metal Worker	-.009	-.011	-.070	.041	-.025	1.000	.032	-.012	-.036	.132	-.020	.063	.056	.030	.157	.013	-.054	-.022
	Welding Skills	.065	.100	.133	.144	.020	.032	1.000	.051	.072	.174	.027	.069	-.018	.017	-.026	.098	.031	.164
	Masonry	-.037	-.059	.061	.130	.052	-.012	.051	1.000	.094	.149	-.036	-.020	.112	.002	.099	-.087	.167	.039
	Gas Cutter	.028	.069	.021	-.009	.127	-.036	.072	.094	1.000	.079	-.040	.071	.038	.071	-.014	-.058	-.101	-.005
	Electrician	.113	.095	.043	.151	.014	.132	.174	.149	.079	1.000	.107	.075	.039	.026	.084	-.007	.186	.069
	Painting Skills	.073	.222	-.067	-.049	.026	.063	.069	-.020	.071	.075	.053	1.000	.029	.015	.070	.007	-.041	.040
	Draughtsman Mechanical	.033	-.043	.118	.106	.074	.013	.098	-.087	-.058	-.007	-.028	.007	-.066	-.070	.131	1.000	.109	.042
	Line Operator	.008	-.025	.117	.096	.021	-.054	.031	.167	-.101	.186	-.004	-.041	.049	.071	.085	.109	1.000	.129
	Crane Operating Skills	.116	.004	.099	.080	.042	-.022	.164	.039	-.005	.069	.019	.040	-.104	-.009	.101	.042	.129	1.000
Sig. (1-tailed)	Lineman Skills		.095	.360	.032	.035	.426	.090	.224	.286	.010	.384	.067	.023	.440	.279	.250	.433	.008
	Wireman Skills	.095		.005	.266	.438	.408	.020	.112	.078	.025	.457	.000	.399	.271	.020	.188	.307	.470
	Plumbing Skills	.360	.005		.001	.039	.074	.003	.105	.336	.189	.025	.082	.402	.244	.181	.008	.008	.020
	Foundry man	.032	.266	.001		.202	.202	.001	.004	.427	.001	.359	.158	.313	.386	.012	.014	.023	.050
	Carpenters Skills	.035	.438	.039	.202		.305	.341	.144	.004	.388	.414	.299	.074	.006	.026	.063	.332	.192
	Sheet Metal Worker	.426	.408	.074	.202	.305		.257	.405	.231	.003	.337	.098	.126	.266	.001	.391	.133	.328
	Welding Skills	.090	.020	.003	.001	.341	.257		.148	.069	.000	.290	.078	.359	.365	.293	.022	.263	.000
	Masonry	.224	.112	.105	.004	.144	.405	.148		.026	.001	.232	.340	.010	.484	.021	.037	.000	.214
	Gas-Cutter	.286	.078	.336	.427	.004	.231	.069	.026		.052	.203	.071	.215	.072	.385	.115	.018	.458
	Electrician	.010	.025	.189	.001	.388	.003	.000	.001	.052		.013	.061	.212	.300	.041	.440	.000	.077
	Painting Skills	.067	.000	.082	.158	.299	.098	.078	.340	.071	.061	.136		.278	.382	.074	.442	.200	.204
	Draughtsman Mechanical	.250	.188	.008	.014	.063	.391	.022	.037	.115	.440	.279	.442	.088	.075	.003		.012	.195
	Line Operator	.433	.307	.008	.023	.332	.133	.263	.000	.018	.000	.465	.200	.158	.072	.041	.012		.004
	Crane Operating Skills	.008	.470	.020	.050	.192	.328	.000	.214	.458	.077	.349	.204	.016	.428	.018	.195	.004	
a. Determinant = .413																			

4.7.4.1 Reliability, Validity & Internal Consistency - Construction of Switchyard

Table 4.45: Reliability, Validity & Internal Consistency - Construction of Switchyard				
Electro Activity 4	KMO and Bartlett's Test			Reliability Statistics
Construction of Switchyard	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.561	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	368.115	.825
		Df	171	
		Sig.	.000	

In the table 4.45, (i) Cronbachs Alpha is 0.825, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.7.4.2 Total Variance - Construction of Switchyard

Table 4.46: Total Variance - Construction of Switchyard									
	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.882	9.908	9.908	1.882	9.908	9.908	1.509	7.942	7.942
2	1.512	7.956	17.864	1.512	7.956	17.864	1.452	7.644	15.586
3	1.311	6.901	24.765	1.311	6.901	24.765	1.354	7.127	22.712
4	1.246	6.559	31.324	1.246	6.559	31.324	1.294	6.812	29.524
5	1.163	6.118	37.443	1.163	6.118	37.443	1.269	6.677	36.201
6	1.129	5.942	43.385	1.129	5.942	43.385	1.241	6.530	42.731
7	1.082	5.693	49.078	1.082	5.693	49.078	1.117	5.878	48.609
8	1.022	5.379	54.456	1.022	5.379	54.456	1.111	5.847	54.456
9	.996	5.241	59.698						
10	.979	5.153	64.851						
11	.899	4.733	69.584						
12	.857	4.512	74.096						
13	.827	4.353	78.448						
14	.770	4.054	82.502						
15	.743	3.908	86.411						

16	.706	3.718	90.129						
17	.645	3.393	93.521						
18	.632	3.324	96.845						
19	.599	3.155	100.000						
Extraction Method: Principal Component Analysis.									

Explanation of the total variance is done with help of the initial 10 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 10 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Electro- Mechanical Activity 4 - Construction of Switchyard

4.7.4.3 Rotated Component Matrix - Construction of Switchyard

Table 4.47: Rotated Component Matrix - Construction of Switchyard

	Component							
	1	2	3	4	5	6	7	8
Lineman Skills		.404					.432	
Wireman Skills		.680						
Plumbing Skills	.438							
Foundry man	.531							
Carpenters Skills						.782		
Sheet Metal Worker					.734			
Welding Skills	.695							
Masonry			.668					
Gas-Cutter				-.415		.520		
Electrician								
Draughtsman Civil Skills								
Surveyors Skills								.819
Painting Skills		.617						
Fitters Skills			.586					
Mechanic							-.711	
Information Technology and Electronic System Maintenance					.669			

Line Operator				.661				
Crane Operating Skills				.519				
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]								
a. Rotation converged in 13 iterations.								

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.7.5 Task B (Electro-Mechanical Works) – Results

Anexhaustive analysis was conducted in order to discern the activity wise significant skill gaps. To achieve this mentioned aim, analysis was conducted with help of Spss 21 version was used. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cutoff of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent).

Table 4.48: Task B (Electro-Mechanical Works) – Results

Electro-Mechanical	Activity 1	Activity 2	Activity 3	Activity 4
Plumbing Skills	0.859			
Construction Machinery Mechanic cum Operator	0.77			
Surveyors Skills	0.816			0.818
Carpenters Skills	0.732			0.782
Masonry		0.741	0.761	
Wireman Skills			0.795	
Sheet Metal Worker				0.733

As per table 4.48 in each activity some factors are taken significant as findings of the study. Further below, we will be explaining the factors of each activity respectively.

Activity 1 (Task B) – In activity 1, the researcher deciphers that the study has observed 13 factors out of which only 4 factors are considered significant. Being, (i) Plumbing Skills (ii) Construction Machinery Mechanic cum Operator (iii) Surveyors Skills (iv) Carpenters Skills.

Among these the "Plumbing Skills" is considered the most significant with the value of 0.859.

Activity 2 (Task B) – In activity 2, the researcher deciphers that the study has observed 20 factors out of which only 1 factor is considered significant. Being, (i) Masonry Skills with the value of 0.741.

Activity 3 (Task B) – In activity 3, the researcher deciphers that the study has observed 13 factors out of which only 2 factors are considered significant. Being,(i) Masonry Skills (ii) Wireman Skills.

Among these the "Wireman Skills" is considered the most significant with the value of 0.795.

Activity 4 (Task B) – In activity 4, the researcher deciphers that the study has observed 19 factors out of which only 3 factors are considered significant. Being,(i) Surveyors Skills (ii) Carpenters Skills (iii) Sheet Metal Worker

Among these the "Surveyors Skills" is considered the most significant with the value of 0.818.

4.8 Task C - Hydro- Mechanical Works

Hydro- Mechanical Works is relating to a branch of mechanics that deals with the equilibrium and motion of fluids and of solid bodies immersed in them.

Respondents were questioned about significant skills sets required in Hydro-Mechanical Activity Areas and (i) Correlation Matrix (ii) Reliability, Validity & Internal Consistency (iii) Total Variance (iv) Rotated Component Matrix, are as below-

4.8.1 Hydro - Mechanical Activity 1 - Weir Gate

Table 4.49: Correlation Matrix - Weir Gate

Correlation Matrix																				
		Lineman Skills	Wireman Skills	Painting Skills	Sheet Metal Works	Welding Skills	Gas Cutter	Electrician	Fitter's Skills	Turner Skills	Crane Mechanic	Draughtsman (Civil) Skills	Draughtsman (Mechanical)	Foundry man	Carpenters Skills	Masonry	Surveyor's Skills	Housekeeper	Storekeeper	Plumbing Skills
Correlation	Lineman Skills	1.000	-.018	.123	.003	-.021	.100	-.115	-.084	.097	.026	.062	.015	-.040	.002	.095	.114	-.013	.054	.063
	Wireman Skills	-.018	1.000	.046	-.022	-.013	.122	-.028	-.047	.001	-.014	-.087	-.063	.051	-.092	.066	.000	-.038	-.052	.012
	Painting Skills	.123	.046	1.000	-.043	.001	.013	.229	-.016	-.109	-.010	-.077	-.030	.087	-.056	.015	-.006	.051	.086	.001
	Sheet Metal Works	.003	-.022	-.043	1.000	.002	.070	.031	.103	-.010	.087	-.046	.120	-.052	-.137	-.057	-.106	.026	-.132	.122
	Welding Skills	-.021	-.013	.001	.002	1.000	-.124	-.011	.042	.120	-.083	.128	.003	.001	-.018	-.015	-.059	-.010	.042	-.014
	Gas Cutter	.100	.122	.013	.070	-.124	1.000	-.090	-.043	-.111	.040	-.126	.030	-.032	.073	.076	.088	.081	-.102	.093
	Electrician	-.115	-.028	.229	.031	-.011	-.090	1.000	.029	-.072	.018	.002	-.003	-.099	-.016	.019	-.056	.045	.095	.067
	Fitter's Skills	-.084	-.047	-.016	.103	.042	-.043	.029	1.000	.144	.021	.004	.121	.005	.088	-.045	-.031	-.087	-.045	-.052
	Turner Skills	.097	.001	-.109	-.010	.120	-.111	-.072	.144	1.000	.003	-.013	-.083	.033	.095	-.078	.036	.014	.097	-.050
	Crane Mechanic	.026	-.014	-.010	.087	-.083	.040	.018	.021	.003	1.000	.120	.074	-.053	-.060	.019	-.189	-.063	-.027	.005
	Draughtsman (Civil) Skills	.062	-.087	-.077	-.046	.128	-.126	.002	.004	-.013	.120	1.000	.084	-.041	-.055	.006	.042	.063	-.038	-.004
	Draughtsman (Mechanical)	.015	-.063	-.030	.120	.003	.030	-.003	.121	-.083	.074	.084	1.000	.052	.042	.057	.054	-.007	-.067	.009
	Foundry man	-.040	.051	.087	-.052	.001	-.032	-.099	.005	.033	-.053	-.041	.052	1.000	.160	-.026	-.176	-.011	-.012	-.029
	Surveyor's Skills	.114	.000	-.006	-.106	-.059	.088	-.056	-.031	.036	-.189	.042	.054	-.176	-.030	-.025	1.000	.097	-.045	.033
	Housekeeper	-.013	-.038	.051	.026	-.010	.081	.045	-.087	.014	-.063	.063	-.007	-.011	-.074	-.157	.097	1.000	-.177	-.062
	Storekeeper	.054	-.052	.086	-.132	.042	-.102	.095	-.045	.097	-.027	-.038	-.067	-.012	.087	.015	-.045	-.177	1.000	.082
	Plumbing Skills	.063	.012	.001	.122	-.014	.093	.067	-.052	-.050	.005	-.004	.009	-.029	-.024	.049	.033	-.062	.082	1.000
Sig. (1-tailed)	Lineman Skills		.391	.027	.479	.373	.057	.035	.094	.063	.342	.165	.405	.267	.486	.067	.036	.418	.199	.160
	Wireman Skills	.391		.233	.364	.420	.027	.329	.231	.496	.412	.085	.159	.211	.074	.148	.500	.275	.205	.428
	Painting Skills	.027	.233		.249	.493	.417	.000	.401	.043	.436	.112	.319	.085	.190	.410	.464	.210	.089	.493
	Sheet Metal Works	.479	.364	.249		.488	.135	.311	.052	.437	.085	.235	.030	.207	.015	.186	.048	.340	.019	.027
	Welding Skills	.373	.420	.493	.488		.026	.433	.257	.030	.097	.022	.479	.492	.389	.404	.178	.438	.254	.416
	Gas Cutter	.057	.027	.417	.135	.026		.077	.251	.040	.265	.024	.317	.308	.126	.115	.083	.101	.054	.072
	Electrician	.035	.329	.000	.311	.433	.077		.327	.129	.388	.488	.481	.060	.401	.383	.190	.239	.067	.147
	Fitter's Skills	.094	.231	.401	.052	.257	.251	.327		.012	.372	.477	.029	.469	.082	.239	.314	.086	.240	.207
	Turner Skills	.063	.496	.043	.437	.030	.040	.129	.012		.481	.416	.095	.301	.066	.110	.286	.412	.064	.216
	Crane Mechanic	.342	.412	.436	.085	.097	.265	.388	.372	.481		.029	.123	.204	.174	.383	.001	.160	.336	.469
	Draughtsman (Civil) Skills	.165	.085	.112	.235	.022	.024	.488	.477	.416	.029		.093	.261	.192	.464	.254	.161	.277	.472
	Draughtsman (Mechanical)	.405	.159	.319	.030	.479	.317	.481	.029	.095	.123	.093		.207	.256	.187	.200	.457	.146	.446
	Foundry man	.267	.211	.085	.207	.492	.308	.060	.469	.301	.204	.261	.207		.006	.340	.003	.434	.424	.326
	Surveyor's Skills	.036	.500	.464	.048	.178	.083	.190	.314	.286	.001	.254	.200	.003	.321	.347		.063	.238	.304
	Housekeeper	.418	.275	.210	.340	.438	.101	.239	.086	.412	.160	.161	.457	.434	.123	.007	.063		.003	.165
	Storekeeper	.199	.205	.089	.019	.254	.054	.067	.240	.064	.336	.277	.146	.424	.087	.409	.238	.003		.098
	Plumbing Skills	.160	.428	.493	.027	.416	.072	.147	.207	.216	.469	.472	.446	.326	.351	.220	.304	.165	.098	

4.8.1.1 Reliability, Validity & Internal Consistency - Weir Gate

Table 4.50: Reliability, Validity & Internal Consistency - Weir Gate				
Hydro-Mechanical Activity 1	KMO and Bartlett's Test			Reliability Statistics
Weir Gate	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.491	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	227.829	.632
		Df	171	
		Sig.	.002	

In the table 4.50, (i) Cronbachs Alpha is 0.632, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.8.1.2 Total Variance - Weir Gate

Table 4.51: Total Variance - Weir Gate										
		Initial Eigen values[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	3.320	8.077	8.077	1.534	8.071	8.071	1.341	7.058	7.058
	2	3.119	7.587	15.665	1.423	7.487	15.558	1.325	6.974	14.033
	3	3.048	7.415	23.080	1.390	7.315	22.873	1.324	6.970	21.002
	4	2.962	7.207	30.287	1.341	7.061	29.933	1.295	6.816	27.818
	5	2.778	6.759	37.046	1.307	6.879	36.812	1.280	6.736	34.554
	6	2.587	6.295	43.340	1.176	6.190	43.003	1.251	6.582	41.136
	7	2.491	6.061	49.401	1.144	6.022	49.025	1.244	6.548	47.684
	8	2.360	5.742	55.143	1.106	5.820	54.844	1.232	6.484	54.168
	9	2.301	5.597	60.740	1.068	5.620	60.464	1.196	6.296	60.464
	10	2.155	5.243	65.984						
	11	1.961	4.771	70.755						
	12	1.894	4.608	75.362						
	13	1.772	4.310	79.672						
	14	1.712	4.164	83.836						
	15	1.503	3.657	87.493						

	16	1.457	3.545	91.038						
	17	1.341	3.262	94.301						
	18	1.208	2.939	97.240						
Extraction Method: Principal Component Analysis.										
a. When analyzing a covariance matrix, the initial Eigen values are the same across the raw and rescaled solution.										

Explanation of the total variance is done with help of the initial 9 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 9 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Hydro - Mechanical Activity 1 - Weir Gate

4.8.1.3 Rotated Component Matrix - Weir Gate

Table 4.52: Rotated Component Matrix - Weir Gate

	Raw								Rescaled							
	Component								Component							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Lineman Skills								1.196								.826
Wireman Skills																
Painting Skills			1.092								.740					
Sheet Metal Works						.683								.483		
Welding Skills	.965								.653							
Gas Cutter	-.926								-.623							
Electrician			1.161								.762					
Fitter's Skills						.985								.681		
Turner Skills						.725	-.592							.497	-.405	
Crane Mechanic					1.068								.737			
Draughtsman (Civil) Skills	.852								.573							
Draughtsman (Mechanical)							1.232								.806	
Foundry man				1.302								.851				
Carpenters Skills				.651								.454				

Masonry		.800								.547						
Surveyor's Skills					-1.011								-.680			
Housekeeper		-1.081								-.754						
Storekeeper		.747								.511						
Plumbing Skills																

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.8.2 Hydro - Mechanical Activity 2 - Construction of Intake

Table 4.53: Correlation Matrix - Construction of Intake

Correlation Matrix															
		Masonry	Draughtsman (Civil) Skills	Construction Machinery Mechanic cum Operator	Surveyor's Skills	Crane Operating Skills	Lineman Skills	Wireman Skills	Plumbing Skills	Foundry man	Carpenters Skills	Sheet Metal Works	Welding Skills	Gas Cutter	Electrician
Correlation	Masonry	1.000	-.006	.090	.026	.094	.097	-.022	-.040	-.102	.052	-.001	-.068	-.008	.058
	Draughtsman (Civil) Skills	-.006	1.000	.039	.142	.037	-.039	-.006	-.014	-.009	.034	.014	-.059	.005	-.044
	Construction Machinery Mechanic cum Operator	.090	.039	1.000	-.018	.018	.166	.010	-.120	.004	.076	.037	-.055	-.024	.133
	Surveyor's Skills	.026	.142	-.018	1.000	.057	.007	.047	-.001	.053	.000	.010	.052	-.009	-.014
	Crane Operating Skills	.094	.037	.018	.057	1.000	.056	-.020	-.064	.006	.040	.025	.056	.116	.014
	Lineman Skills	.097	-.039	.166	.007	.056	1.000	-.026	.011	.028	-.120	-.017	-.073	-.085	.125
	Wireman Skills	-.022	-.006	.010	.047	-.020	-.026	1.000	.060	.085	.011	.095	.004	-.082	.020
	Plumbing Skills	-.040	-.014	-.120	-.001	-.064	.011	.060	1.000	-.067	-.023	-.005	.020	.086	.020
	Foundry man	-.102	-.009	.004	.053	.006	.028	.085	-.067	1.000	.049	.073	-.021	-.082	-.011
	Carpenters Skills	.052	.034	.076	.000	.040	-.120	.011	-.023	.049	1.000	-.082	-.018	.012	-.031
	Sheet Metal Works	-.001	.014	.037	.010	.025	-.017	.095	-.005	.073	-.082	1.000	-.094	.064	-.023
	Welding Skills	-.068	-.059	-.055	.052	.056	-.073	.004	.020	-.021	-.018	-.094	1.000	.081	.024
	Gas Cutter	-.008	.005	-.024	-.009	.116	-.085	-.082	.086	-.082	.012	.064	.081	1.000	.039
	Electrician	.058	-.044	.133	-.014	.014	.125	.020	.020	-.011	-.031	-.023	.024	.039	1.000
Sig. (1-tailed)	Masonry		.447	.032	.297	.027	.023	.328	.207	.017	.140	.493	.081	.435	.118
	Draughtsman (Civil) Skills	.447		.214	.002	.220	.209	.448	.388	.429	.240	.386	.112	.462	.183
	Construction Machinery Mechanic cum Operator	.032	.214		.353	.358	.000	.421	.007	.467	.060	.226	.127	.314	.003
	Surveyor's Skills	.297	.002	.353		.122	.446	.165	.493	.138	.499	.421	.143	.425	.388
	Crane Operating Skills	.027	.220	.358	.122		.124	.342	.093	.449	.205	.302	.123	.009	.389
	Lineman Skills	.023	.209	.000	.446	.124		.296	.411	.282	.007	.360	.067	.041	.005
	Wireman Skills	.328	.448	.421	.165	.342	.296		.108	.040	.412	.025	.468	.046	.337
	Plumbing Skills	.207	.388	.007	.493	.093	.411	.108		.085	.316	.462	.343	.037	.340
	Foundry man	.017	.429	.467	.138	.449	.282	.040	.085		.157	.067	.331	.046	.413
	Carpenters Skills	.140	.240	.060	.499	.205	.007	.412	.316	.157		.046	.358	.403	.263
	Sheet Metal Works	.493	.386	.226	.421	.302	.360	.025	.462	.067	.046		.026	.095	.316
	Welding Skills	.081	.112	.127	.143	.123	.067	.468	.343	.331	.358	.026		.047	.307
	Gas Cutter	.435	.462	.314	.425	.009	.041	.046	.037	.046	.403	.095	.047		.214
	Electrician	.118	.183	.003	.388	.389	.005	.337	.340	.413	.263	.316	.307	.214	

4.8.2.1 Reliability, Validity & Internal Consistency - Construction of Intake

Table 4.54: Reliability, Validity & Internal Consistency - Construction of Intake				
Hydro-Mechanical Activity 2	KMO and Bartlett's Test			Reliability Statistics
Construction of Intake	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.489	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	137.189	.635
		df	91	
		Sig.	.001	

In the table 4.54, (i) Cronbachs Alpha is 0.635, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.8.2.2 Total Variance Explained - Construction of Intake

Table 4.55: Total Variance - Construction of Intake									
	Initial Eigen values[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.999	10.507	10.507	1.398	9.984	9.984	1.249	8.925	8.925
2	2.715	9.510	20.017	1.217	8.694	18.679	1.172	8.371	17.295
3	2.515	8.812	28.829	1.241	8.862	27.541	1.171	8.367	25.662
4	2.349	8.230	37.059	1.142	8.159	35.700	1.151	8.223	33.885
5	2.262	7.923	44.982	1.081	7.724	43.423	1.143	8.164	42.048
6	2.240	7.845	52.828	1.085	7.751	51.174	1.142	8.160	50.208
7	2.096	7.342	60.170	1.003	7.167	58.341	1.139	8.133	58.341
8	1.983	6.947	67.116						
9	1.896	6.641	73.757						
10	1.712	5.997	79.754						
11	1.634	5.724	85.479						
12	1.536	5.382	90.861						
13	1.397	4.895	95.756						

14	1.211	4.244	100.000							

Extraction Method: Principal Component Analysis.

a. When analyzing a covariance matrix, the initial Eigen values are the same across the raw and rescaled solution.

Explanation of the total variance is done with help of the initial 7 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 7 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 7 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Hydro - Mechanical Activity 2 - Construction of Intake

4.8.2.3 Rotated Component Matrix - Construction of Intake

Table 4.56: Rotated Component Matrix - Construction of Intake

	Raw							Rescaled						
	Component							Component						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Masonry			-.921							-.628				
Draughtsman (Civil) Skills					1.066							.715		
Construction Machinery Mechanic cum Operator	1.210							.802						
Surveyor's Skills					1.189							.780		
Crane Operating Skills							1.240							.834
Lineman Skills	.639					.738		.446					.515	
Wireman Skills														
Plumbing Skills		.629							.444					
Foundry man			.935							.665				
Carpenters Skills						-1.024							-.722	
Sheet Metal Works			.649	-.827						.451	-.574			
Welding Skills				1.032							.725			
Gas Cutter		.939							.690					
Electrician	.876							.619						

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 11 iterations.

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called ‘Component’. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.8.3 Hydro - Mechanical Activity 3 - Trash Rack – Fabrication

Table 4.57: Correlation Matrix - Trash Rack – Fabrication

Correlation Matrix														
		Lineman Skills	Wireman Skills	Painting Skills	Sheet Metal Works	Welding Skills	Gas Cutter	Electrician	Turner Skills	Crane Mechanic	Draughtsman (Civil) Skills	Draughtsman (Mechanical)	Foundry man	Carpenters Skills
Correlation	Lineman Skills	1.000	-.036	-.003	.153	.024	.082	.039	.043	.019	-.052	-.007	-.079	.137
	Wireman Skills	-.036	1.000	.085	.066	.097	.052	-.061	.012	-.047	.013	.004	-.057	.032
	Painting Skills	-.003	.085	1.000	.037	-.016	.075	-.006	-.007	.036	.055	-.018	.029	-.003
	Sheet Metal Works	.153	.066	.037	1.000	.064	.038	.036	-.032	-.019	.036	-.091	-.044	.115
	Welding Skills	.024	.097	-.016	.064	1.000	.075	.038	-.039	.013	.033	.019	.037	-.032
	Gas Cutter	.082	.052	.075	.038	.075	1.000	.018	.008	.023	.090	.061	-.040	-.077
	Electrician	.039	-.061	-.006	.036	.038	.018	1.000	.034	-.114	.044	-.019	.101	-.021
	Turner Skills	.043	.012	-.007	-.032	-.039	.008	.034	1.000	-.020	-.018	-.016	.051	.069
	Crane Mechanic	.019	-.047	.036	-.019	.013	.023	-.114	-.020	1.000	.002	.027	.002	.056
	Draughtsman (Civil) Skills	-.052	.013	.055	.036	.033	.090	.044	-.018	.002	1.000	.025	-.099	.008
	Draughtsman (Mechanical)	-.007	.004	-.018	-.091	.019	.061	-.019	-.016	.027	.025	1.000	.044	-.027
	Foundry man	-.079	-.057	.029	-.044	.037	-.040	.101	.051	.002	-.099	.044	1.000	.016
	Carpenters Skills	.137	.032	-.003	.115	-.032	-.077	-.021	.069	.056	.008	-.027	.016	1.000
Sig. (1-tailed)	Lineman Skills		.230	.477	.001	.310	.047	.213	.188	.346	.144	.441	.053	.002
	Wireman Skills	.230		.040	.087	.023	.145	.105	.401	.169	.392	.471	.119	.256
	Painting Skills	.477	.040		.221	.370	.061	.450	.441	.227	.129	.354	.274	.478
	Sheet Metal Works	.001	.087	.221		.095	.221	.232	.258	.352	.232	.030	.182	.009
	Welding Skills	.310	.023	.370	.095		.063	.218	.210	.398	.247	.347	.224	.254
	Gas Cutter	.047	.145	.061	.221	.063		.356	.432	.321	.032	.104	.205	.057
	Electrician	.213	.105	.450	.232	.218	.356		.242	.009	.184	.350	.019	.336
	Turner Skills	.188	.401	.441	.258	.210	.432	.242		.342	.359	.372	.148	.080
	Crane Mechanic	.346	.169	.227	.352	.398	.321	.009	.342		.488	.287	.488	.124
	Draughtsman (Civil) Skills	.144	.392	.129	.232	.247	.032	.184	.359	.488		.302	.021	.433
	Draughtsman (Mechanical)	.441	.471	.354	.030	.347	.104	.350	.372	.287	.302		.186	.288
	Foundry man	.053	.119	.274	.182	.224	.205	.019	.148	.488	.021	.186		.371
	Carpenters Skills	.002	.256	.478	.009	.254	.057	.336	.080	.124	.433	.288	.371	

4.8.3.1 Reliability, Validity & Internal Consistency - Trash Rack – Fabrication

Table 4.58: Reliability, Validity & Internal Consistency - Trash Rack – Fabrication				
Hydro-Mechanical Activity 3	KMO and Bartlett's Test			Reliability Statistics
Trash Rack – Fabrication	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.490	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	97.696	.667
		Df	78	
		Sig.	.065	

In the table 4.58, (i) Cronbachs Alpha is 0.767, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.8.3.2 Total Variance - Trash Rack – Fabrication

Table 4.59: Total Variance - Trash Rack – Fabrication										
		Initial Eigen values[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	2.797	10.413	10.413	1.332	10.247	10.247	1.297	9.975	9.975
	2	2.588	9.634	20.047	1.240	9.535	19.782	1.168	8.982	18.956
	3	2.428	9.036	29.083	1.178	9.060	28.842	1.140	8.771	27.727
	4	2.362	8.793	37.876	1.077	8.281	37.123	1.139	8.763	36.490
	5	2.220	8.264	46.140	1.083	8.329	45.452	1.128	8.679	45.169
	6	2.174	8.091	54.231	1.047	8.052	53.504	1.061	8.159	53.328
	7	2.116	7.875	62.106	1.029	7.918	61.422	1.052	8.093	61.422
	8	1.999	7.443	69.548						
	9	1.854	6.901	76.449						
	10	1.706	6.351	82.800						
	11	1.616	6.017	88.817						
Extraction Method: Principal Component Analysis.										
a. When analyzing a covariance matrix, the initial eigenvalues are the same across the raw and rescaled solution.										

Explanation of the total variance is done with help of the initial 7 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of

the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 7 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 7 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Hydro - Mechanical Activity 3 - Trash Rack – Fabrication

4.8.3.3 Rotated Component Matrix – Trash Rack – Fabrication

Table 4.60: Rotated Component Matrix - Trash Rack – Fabrication

	Raw							Rescaled						
	Component							Component						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Lineman Skills	1.040							.723						
Wireman Skills					1.084							.774		
Painting Skills						1.462							.950	
Sheet Metal Works	.916							.632						
Welding Skills					.810							.566		
Gas Cutter			.974							.676				
Electrician		1.115							.777					
Turner Skills							1.350							.918
Crane Mechanic		-.855							-.595					
Draughtsman (Civil) Skills				-.857							-.596			
Draughtsman (Mechanical)			.689							.498				
Foundry man				1.077							.754			
Carpenters Skills	.710							.512						

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 14 iterations.

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.8.4 Hydro - Mechanical Activity 4 - Intake Gates - Installation of bed embedment's

Table 4.61: Correlation Matrix - Intake Gates - Installation of bed embedment's

Correlation Matrix																			
		Lineman Skills	Wireman Skills	Painting Skills	Sheet Metal Works	Welding Skills	Gas Cutter	Electrician	Fitters Skills	Turner Skills	Crane Mechanic	Draughtsman (Civil) Skills	Draughtsman (Mechanical)	Plumbing Skills	Foundry man	Carpenters Skills	Surveyors Skills	Housekeeper	Storekeeper
Correlation	Lineman Skills	1.000	-.085	-.026	-.073	.044	-.007	.016	.057	-.005	-.024	-.032	-.011	.049	-.015	-.003	.005	.012	-.028
	Wireman Skills	-.085	1.000	.032	.099	.051	-.062	.084	-.032	-.039	.004	.089	.034	-.011	.009	-.033	.008	.027	.055
	Painting Skills	-.026	.032	1.000	-.039	-.064	-.038	.009	.028	.055	-.019	-.020	.039	-.004	.024	-.029	-.009	-.009	.005
	Sheet Metal Works	-.073	.099	-.039	1.000	-.030	-.047	.037	.077	-.011	.031	.048	-.022	.109	.004	-.040	.003	-.040	.043
	Welding Skills	.044	.051	-.064	-.030	1.000	.061	.100	-.032	.064	.011	-.061	-.050	-.035	.016	-.009	.024	-.065	.076
	Gas Cutter	-.007	-.062	-.038	-.047	.061	1.000	-.006	-.015	-.008	-.008	.010	.008	-.037	-.055	-.007	-.110	.051	-.028
	Electrician	.016	.084	.009	.037	.100	-.006	1.000	.034	.073	.112	-.010	-.067	.011	.003	-.010	.048	.049	-.026
	Fitters Skills	.057	-.032	.028	.077	-.032	-.015	.034	1.000	-.008	.067	.009	.025	-.040	-.032	.121	-.075	-.040	.102
	Turner Skills	-.005	-.039	.055	-.011	.064	-.008	.073	-.008	1.000	-.008	.027	-.026	.044	.036	.007	.014	.019	.000
	Crane Mechanic	-.024	.004	-.019	.031	.011	-.008	.112	.067	-.008	1.000	-.010	-.110	.035	.065	.033	.030	-.066	.049
	Draughtsman (Civil) Skills	-.032	.089	-.020	.048	-.061	.010	-.010	.009	.027	-.010	1.000	.025	.024	.096	-.033	.035	.039	.032
	Draughtsman (Mechanical)	-.011	.034	.039	-.022	-.050	.008	-.067	.025	-.026	-.110	.025	1.000	.017	.051	.052	.004	.017	-.042
	Plumbing Skills	.049	-.011	-.004	.109	-.035	-.037	.011	-.040	.044	.035	.024	.017	1.000	.050	.043	.066	.009	-.137
	Foundry man	-.015	.009	.024	.004	.016	-.055	.003	-.032	.036	.065	.096	.051	.050	1.000	.057	.075	-.050	-.066
	Carpenters Skills	-.003	-.033	-.029	-.040	-.009	-.007	-.010	.121	.007	.033	-.033	.052	.043	.057	1.000	.001	.091	-.074
	Surveyors Skills	.005	.008	-.009	.003	.024	-.110	.048	-.075	.014	.030	.035	.004	.066	.075	.001	1.000	-.024	.002
	Housekeeper	.012	.027	-.009	-.040	-.065	.051	.049	-.040	.019	-.066	.039	.017	.009	-.050	.091	-.024	1.000	-.055
	Storekeeper	-.028	.055	.005	.043	.076	-.028	-.026	.102	.000	.049	.032	-.042	-.137	-.066	-.074	.002	-.055	1.000
Sig. (1-tailed)	Lineman Skills		.041	.300	.066	.181	.445	.371	.122	.458	.309	.252	.411	.159	.381	.478	.461	.400	.281
	Wireman Skills	.041		.256	.021	.149	.101	.042	.253	.211	.469	.034	.244	.410	.423	.248	.433	.289	.129
	Painting Skills	.300	.256		.214	.093	.219	.426	.280	.131	.349	.343	.213	.466	.308	.273	.426	.423	.456
	Sheet Metal Works	.066	.021	.214		.266	.168	.221	.056	.414	.260	.164	.329	.013	.471	.208	.472	.206	.186
	Welding Skills	.181	.149	.093	.266		.104	.020	.254	.096	.413	.107	.152	.239	.373	.427	.309	.092	.060
	Gas Cutter	.445	.101	.219	.168	.104		.454	.375	.433	.432	.421	.434	.221	.129	.439	.012	.148	.282
	Electrician	.371	.042	.426	.221	.020	.454		.243	.066	.011	.422	.084	.413	.478	.415	.163	.158	.295
	Fitters Skills	.122	.253	.280	.056	.254	.375	.243		.436	.086	.423	.302	.208	.256	.006	.061	.208	.018
	Turner Skills	.458	.211	.131	.414	.096	.433	.066	.436		.436	.289	.297	.184	.227	.439	.384	.345	.497
	Crane Mechanic	.309	.469	.349	.260	.413	.432	.011	.086	.436		.421	.012	.236	.091	.246	.268	.087	.159
	Draughtsman (Civil) Skills	.252	.034	.343	.164	.107	.421	.422	.423	.289	.421		.302	.313	.024	.247	.237	.212	.254
	Draughtsman (Mechanical)	.411	.244	.213	.329	.152	.434	.084	.302	.297	.012	.302		.363	.149	.143	.469	.364	.192
	Plumbing Skills	.159	.410	.466	.013	.239	.221	.413	.208	.184	.236	.313	.363		.154	.189	.088	.430	.002
	Foundry man	.381	.423	.308	.471	.373	.129	.478	.256	.227	.091	.024	.149	.154		.120	.062	.152	.086
	Carpenters Skills	.478	.248	.273	.208	.427	.439	.415	.006	.439	.246	.247	.143	.189	.120		.492	.030	.063
	Surveyors Skills	.461	.433	.426	.472	.309	.012	.163	.061	.384	.268	.237	.469	.088	.062	.492		.310	.483
	Housekeeper	.400	.289	.423	.206	.092	.148	.158	.208	.345	.087	.212	.364	.430	.152	.030	.310		.127
	Storekeeper	.281	.129	.456	.186	.060	.282	.295	.018	.497	.159	.254	.192	.002	.086	.063	.483	.127	

4.8.4.1 Reliability, Validity & Internal Consistency - Intake Gates - Installation of bed embedments

Table 4.62: Reliability, Validity & Internal Consistency - Intake Gates - Installation of bed embedment				
Hydro-Mechanical Activity 4	KMO and Bartlett's Test			Reliability Statistics
4 Intake Gates - Installation of bed embedment's	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.492	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	149.464	.594
		df	153	
		Sig.	.566	

In the table 4.62, (i) Cronbachs Alpha is 0.594, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett's test of Sphericity is 0.000 and is hence rejected.

4.8.4.2 Total Variance - Intake Gates - Installation of bed embedment's

Table 4.63: Total Variance - Intake Gates - Installation of bed embedment's

Component		Initial Eigen values[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Rescaled	1	7.656	19.693	19.693	1.076	5.976	5.976	1.226	6.814	6.814
	2	2.670	6.867	26.560	1.323	7.352	13.328	1.223	6.795	13.609
	3	2.369	6.093	32.653	1.212	6.731	20.059	1.223	6.793	20.402
	4	2.309	5.939	38.592	1.207	6.704	26.763	1.213	6.738	27.140
	5	2.221	5.712	44.304	1.107	6.153	32.916	1.082	6.012	33.152
	6	2.185	5.621	49.925	1.107	6.151	39.067	1.065	5.915	39.067
	7	2.036	5.236	55.161						
	8	2.009	5.169	60.329						
	9	1.908	4.907	65.237						
	10	1.816	4.671	69.908						
	11	1.706	4.388	74.295						
	12	1.658	4.266	78.561						
	13	1.542	3.966	82.527						

Extraction Method: Principal Component Analysis.

a. When analyzing a covariance matrix, the initial eigenvalues are the same across the raw and rescaled solution.

Explanation of the total variance is done with help of the initial 8 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 8 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 8 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1, the factors may describe the Hydro - Mechanical Activity 4 - Intake Gates - Installation of bed embedment's

4.8.4.3 Rotated Component Matrix - Intake Gates - Installation of bed embedment's

Table 4.64: Rotated Component Matrix - Intake Gates - Installation of bed embedment's

	Raw						Rescaled					
	Component						Component					
	1	2	3	4	5	6	1	2	3	4	5	6
Lineman Skills			-.890						-.617			
Wireman Skills			.925						.655			
Painting Skills					1.099						.760	
Sheet Metal Works			.734		-.698				.506		-.482	
Welding Skills						2.729						.994
Gas Cutter		-1.083						-.738				
Electrician	.808						.562					
Fitters Skills												
Turner Skills												
Crane Mechanic	1.087						.755					
Draughtsman (Civil) Skills												
Draughtsman (Mechanical)	-.536						-.404					
Plumbing Skills		.673		.630				.488		.457		
Foundry man												
Carpenters Skills												
Surveyors Skills												
Housekeeper				.561						.426		
Storekeeper				-.755						-.574		

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 9 iterations.

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called ‘Component’. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.8.5 Hydro - Mechanical Activity 5 - Penstock

Table 4.65: Correlation Matrix - Penstock

Correlation Matrix																			
		Lineman Skills	Wireman Skills	Plumbing Skills	Foundry man	Carpenters Skills	Sheet Metal Works	Welding Skills	Masonry	Gas Cutter	Electrician	Draughtsman (Civil) Skills	Surveyors Skills	Fitters Skills	Turner Skills	Crane Mechanic	Draughtsman (Mechanical)	Crane Operating Skills	Welding Skills (Pipes & Pressure Vessels)
Correlation	Lineman Skills	1.000	-.084	-.089	-.056	-.003	.078	.061	-.018	-.109	.011	-.054	-.021	.124	.036	.074	.067	-.065	.052
	Wireman Skills	-.084	1.000	-.080	-.064	.006	-.042	.066	.035	.061	.063	-.001	.012	-.035	.030	-.092	-.100	.074	.028
	Plumbing Skills	-.089	-.080	1.000	-.019	-.008	-.093	.054	.025	.048	.049	.033	-.043	-.045	.065	.006	.043	.134	.098
	Foundry man	-.056	-.064	-.019	1.000	.024	-.017	-.033	-.041	.068	-.187	-.001	-.012	-.037	-.023	.044	-.032	.045	.031
	Carpenters Skills	-.003	.006	-.008	.024	1.000	-.059	-.067	.012	.129	-.060	.016	-.058	.111	.039	.064	.049	-.044	-.018
	Sheet Metal Works	.078	-.042	-.093	-.017	-.059	1.000	.072	-.030	-.075	.028	.048	.066	-.005	-.011	-.044	.040	-.064	.061
	Welding Skills	.061	.066	.054	-.033	-.067	.072	1.000	-.046	.026	.002	.016	.094	-.127	.017	-.093	.029	.096	.378
	Masonry	-.018	.035	.025	-.041	.012	-.030	-.046	1.000	.072	-.103	.007	-.118	.024	-.031	.025	-.051	.072	.000
	Gas Cutter	-.109	.061	.048	.068	.129	-.075	.026	.072	1.000	-.077	.070	-.022	.033	-.028	.087	-.135	.008	.028
	Surveyors Skills	-.021	.012	-.043	-.012	-.058	.066	.094	-.118	-.022	.084	-.010	1.000	-.104	-.071	.029	.011	.045	-.030
	Fitters Skills	.124	-.035	-.045	-.037	.111	-.005	-.127	.024	.033	-.004	.011	-.104	1.000	-.017	-.051	-.055	-.091	-.160
	Turner Skills	.036	.030	.065	-.023	.039	-.011	.017	-.031	-.028	-.039	.027	-.071	-.017	1.000	-.031	-.023	.002	.134
	Crane Mechanic	.074	-.092	.006	.044	.064	-.044	-.093	.025	.087	-.037	-.092	.029	-.051	-.031	1.000	.015	-.159	-.110
	Draughtsman (Mechanical)	.067	-.100	.043	-.032	.049	.040	.029	-.051	-.135	.031	.031	.011	-.055	-.023	.015	1.000	.004	.062
	Crane Operating Skills	-.065	.074	.134	.045	-.044	-.064	.096	.072	.008	-.080	.016	.045	-.091	.002	-.159	.004	1.000	.242
	Welding Skills (Pipes & Pressure Vessels)	.052	.028	.098	.031	-.018	.061	.378	.000	.028	-.083	-.004	-.030	-.160	.134	-.110	.062	.242	1.000
Sig. (1-tailed)	Lineman Skills		.042	.034	.124	.478	.054	.103	.358	.013	.411	.134	.336	.005	.230	.063	.083	.090	.141
	Wireman Skills	.042		.049	.093	.453	.196	.086	.239	.103	.099	.489	.401	.236	.266	.029	.019	.064	.282
	Plumbing Skills	.034	.049		.352	.432	.027	.133	.301	.164	.155	.252	.187	.176	.090	.453	.186	.003	.022
	Foundry man	.124	.093	.352		.314	.364	.248	.200	.080	.000	.492	.405	.221	.320	.185	.254	.179	.265
	Carpenters Skills	.478	.453	.432	.314		.111	.085	.400	.004	.109	.370	.118	.011	.213	.094	.158	.182	.356
	Sheet Metal Works	.054	.196	.027	.364	.111		.069	.270	.060	.283	.162	.087	.456	.412	.181	.207	.093	.103
	Welding Skills	.103	.086	.133	.248	.085	.069		.173	.300	.484	.369	.027	.004	.361	.028	.278	.024	.000
	Masonry	.358	.239	.301	.200	.400	.270	.173		.069	.017	.445	.007	.308	.262	.300	.146	.070	.497
	Gas Cutter	.013	.103	.164	.080	.004	.060	.300	.069		.057	.074	.325	.252	.283	.037	.003	.436	.281
	Surveyors Skills	.336	.401	.187	.405	.118	.087	.027	.007	.325	.043	.422		.016	.072	.277	.414	.178	.272
	Fitters Skills	.005	.236	.176	.221	.011	.456	.004	.308	.252	.471	.412	.016		.362	.148	.130	.030	.000
	Turner Skills	.230	.266	.090	.320	.213	.412	.361	.262	.283	.209	.289	.072	.362		.262	.315	.484	.003
	Crane Mechanic	.063	.029	.453	.185	.094	.181	.028	.300	.037	.220	.030	.277	.148	.262		.382	.001	.011
	Draughtsman (Mechanical)	.083	.019	.186	.254	.158	.207	.278	.146	.003	.262	.259	.414	.130	.315	.382		.465	.102
	Crane Operating Skills	.090	.064	.003	.179	.182	.093	.024	.070	.436	.050	.368	.178	.030	.484	.001	.465		.000
	Welding Skills (Pipes & Pressure Vessels)	.141	.282	.022	.265	.356	.103	.000	.497	.281	.043	.469	.272	.000	.003	.011	.102	.000	

4.8.5.1 Reliability, Validity & Internal Consistency - Penstock

Table 4.66: Reliability, Validity & Internal Consistency - Penstock

Hydro-Mechanical Activity 5	KMO and Bartlett's Test			Reliability Statistics
Penstock	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.543	Cronbach's Alpha
	Bartlett's Test of Sphericity	Approx. Chi-Square	326.329	.680
		Df	153	
		Sig.	.000	

In the table 4.66, (i) Cronbachs Alpha is 0.680, it expresses a higher level for internal consistency in the scale of 5 within some definite sampleling. (ii) Results illustrateKaiser Meyer Olkin and Bartletts test outcomes. The Kaiser Meyer Olkin statistics nearer towards number 1 as an expression of the pattern in correlation becoming compressed and the outcomes will return definite and dependable factors. Kaiser Meyer Olkin measures the sampling adequacy to be 0.493 and is significant. Bartlett’s test of Sphericity is 0.000 and is hence rejected.

4.8.5.2 Total Variance - Penstock

Table 4.67: Total Variance - Penstock

Component	Initial Eigen values[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.940	9.634	9.634	1.714	9.523	9.523	1.595	8.863	8.863
2	2.762	9.051	18.685	1.459	8.107	17.630	1.271	7.063	15.926
3	2.297	7.529	26.214	1.202	6.679	24.309	1.263	7.019	22.945
4	2.210	7.241	33.455	1.225	6.807	31.116	1.249	6.942	29.886
5	2.065	6.767	40.222	1.149	6.382	37.498	1.243	6.904	36.791
6	1.922	6.297	46.520	1.085	6.029	43.526	1.206	6.699	43.490
7	1.835	6.012	52.532	1.105	6.138	49.665	1.112	6.175	49.665
8	1.671	5.475	58.007						
9	1.625	5.325	63.332						
10	1.553	5.090	68.422						
11	1.505	4.932	73.355						
12	1.457	4.776	78.131						
13	1.257	4.120	82.250						
14	1.243	4.074	86.324						
15	1.129	3.700	90.024						
16	1.098	3.600	93.624						
17	1.024	3.357	96.981						

Extraction Method: Principal Component Analysis.

a. When analyzing a covariance matrix, the initial Eigen values are the same across the raw and rescaled solution.

Explanation of the total variance is done with help of the initial 9 factors which have Eigen values more than 1, it is considered almost 60%, where as consecutive variables would give explanation of the balance variables. Upon abstraction the % in the variance of the Eigen Values more than 1 would remain similar. Post rotation the corresponding important 9 factors have drawn nearer. The three initial would account for approximate 21%. The numbers are pretty nearer with other 6 factor who illustrate Eigen value greater than 1. Hence, the corresponding important initial factors get equalized. Therefore, on the basis of the Eigen value which is greater than 1,, the factors may describe the Hydro - Mechanical Activity 5 – Penstock

4.8.5.3 Rotated Component Matrix - Penstock

Table 4.68: Rotated Component Matrix - Penstock

	Raw							Rescaled						
	Component							Component						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Lineman Skills			-.692							-.521				
Wireman Skills					-.518							-.449		
Plumbing Skills			1.098							.785				
Foundry man		-1.041							-.744					
Carpenters Skills														
Sheet Metal Works														
Welding Skills	1.049							.781						
Masonry							1.323							.917
Gas Cutter				.697	-.682						.525	-.514		
Electrician		1.085							.753					
Draughtsman (Civil) Skills														
Surveyors Skills						-.908							-.673	
Fitters Skills														
Turner Skills						.863							.651	
Crane Mechanic				.813							.662			
Draughtsman (Mechanical)					.962							.724		
Crane Operating Skills				-.600							-.466			
Welding Skills (Pipes & Pressure Vessels)	1.001							.770						

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 10 iterations.

Rotated Component Matrix was run using SPSS. The initial first column in the matrix of rotated component would account the variables and their names. The second column in the matrix is called 'Component'. Rest of the sub columns help in identification of the factors.

The result of Rotated Component matrix was not used for identifying the factors from the 48 variables since our aim is to identify the activity wise significant skill gaps. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cut off of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very

good) or 0.71to be considered (excellent). Accordingly the detailed discussion on the results is given in the end of Chapter.

4.8.6 Task C (Hydro-Mechanical Works) – Results

Anexhaustive analysis was conducted in order to discern the activity wise significant skill gaps. To achieve this mentioned aim, analysis was conducted with help of Spss 21 version was used. The level of significance was considered above 0.71 based on the suggestion by (hair Etall 1998, Comrey and lee (1992). Comrey and lee 1992 cited a demanding cutoff of 0.32to be considered (poor), 0.45 to be considered (fair), 0.55to be considered (good), 0.63 to be considered (very good) or 0.71to be considered (excellent).

Table 4.69: Task C (Hydro-Mechanical Works) – Results

Hydro-Mechanical Works	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Lineman skills	1.196	0.738	1.04		
Wireman Skills	1.154		1.084	0.925	
Painting Skills	1.092		1.462	1.099	
Welding Skills	0.965	1.032	0.81	2.729	1.049
Electrician	1.61	0.876	1.115	0.808	1.085
Fitters Skills	0.985				
Turners Skills	0.725		1.35		0.863
Crane Mechanic	1.068			1.087	0.813
Draughtsman (civil) Skills	0.852	1.066			
Draughtsman (Mechanical) Skills	1.232				0.962
Foundry-man	1.302	0.935	1.077		
Masonry	0.8				
Storekeeper	0.747				
Surveyor's Skill		1.189			
Crane Operating Skills	1.24				
Gas Cutter		0.939	0.974		1.323
Sheet Metal Works			0.916	0.734	
Carpenters Skills			0.71		
Masonry					1.098
Construction Machinery Cum Mechanic		1.21			
Welding Skills (Pipes & Pressure Vessel)					1.001

As per table ; in each activity some factors are taken significant as findings of the study. Further below, we will be explaining the factors of each activity respectively.

Activity 1 (Task C) – In activity 1, the researcher deciphers that the study has observed 19 factors out of which 14 factors are considered significant. Being, (i) Lineman skills (ii) Wireman Skills (iii) Painting Skills (iv) Welding Skills (v) Electrician (vi) Fitters Skills (vii) Turners Skills (viii) Crane Mechanic (ix) Draughtsman (civil) Skills (x) Draughtsman (Mechanical) Skills (xi) Foundry-man (xii) Masonry (xiii) Storekeeper (xiv) Crane Operating Skills. Among these the "Electrician Skills" is considered the most significant with the value of 1.61.

Activity 2 (Task C) – In activity 2, the researcher deciphers that the study has observed 14 factors out of which 8 factors are considered significant. Being, (i) Lineman skills (ii) Welding Skills (iii) Electrician (iv) Draughtsman (civil) Skills (v) Foundry-man (vi) Surveyors Skills (vii) Gas-Cutter (viii) Construction Machinery Cum Mechanic. Among these the "Construction Machinery Cum Mechanic" is considered the most significant with the value of 1.21.

Activity 3 (Task C) – In activity 3, the researcher deciphers that the study has observed 13 factors out of which 10 factors are considered significant. Being, (i) Lineman skills (ii) Wireman Skills (iii) Painting Skills (iv) Welding Skills (v) Electrician (vi) Turners Skills (vii) Foundry-man (viii) Gas-Cutter (ix) Sheet Metal Works (x) Carpenters Skills . Among these the "Painting Skills" is considered the most significant with the value of 1.46.

Activity 4 (Task C) – In activity 4, the researcher deciphers that the study has observed 18 factors out of which 6 factors are considered significant. Being, (i) Wireman Skills (ii) Painting Skills (iii) Welding Skills (iv) Electrician (v) Crane Mechanic (vi) Sheet Metal Works Among these the "Welding Skills" is considered the most significant with the value of 2.72.

Activity 5 (Task C) – In activity 5, the researcher deciphers that the study has observed 18 factors out of which 8 factors are considered significant. Being, (i) Welding Skills (ii)

Electrician (iii) Turners Skills (iv) Crane Mechanic (v) Draughtsman Mechanical Skills (vi) Gas-Cutter (vii) Masonry Skills (viii) Welding Skills (Pipes & Pressure Vessel). Among these the “Gas-Cutter Skills” is considered the most significant with the value of 1.32.

4.9 RESULTS – OBJECTIVE 1

Our objective 1 was to identify activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand. For this, the study made a list to understand what are each activities that are done on a construction site of the small hydro power plant. Then these activities were divided into three sets according to their basic trade. Being,

(i) Task A - Civil Work
(ii) Task B - Electro- Mechanical Works
(iii) Task C - Hydro- Mechanical Works

Further now the study will discuss the Findings of the Results of skill sets required to perform each task during the construction phase of small hydro power project in Uttrakhand.

Results – Task A

In Task A is construction of small hydro power project in Civil Works area. Task A civil works have 7 activity sets in which the “surveyor Skills” are considered 5 times. Followed by “Sheet Metal Works”, “Welding Skills” and “Crane Operating Skills” all considered 4 times in total 7 set of activities.

Results – Task B

In Task B in construction of small hydro power project is Electro-Mechanical Works area. Task B, Electro-Mechanical works have 4 activity sets in which the “surveyor Skills”, “Masonry Skills” and “Carpenters Skills” are considered 2 times in total 4 set of activities.

Results – Task C

In Task C of the construction of small hydro power project is Hydro Mechanical Works area. Task c, i.e, Hydro Mechanical works have 5 activity sets in which the “Welding Skills” and “Electrician” are considered 5 times in all 5 sets of activities. Followed by “Lineman Skills”, “Wireman Skills”, “Painting Skills”, “Turners Skills”, “Foundry-man”, “ Gas-Cutter” all considered 3 times in total 5 set of activities.

Combined Results of Objective 1 (Task A + Task B + Task C)

The findings of Task A, Task B and Task C were combined to interpret the results in-order to get a holistic view of the significant skill gaps during the entire construction phase of small hydro power project in Uttrakhand in table 6.2

Table 4.70: Overall Results – Objective 1

Trades	Hydro-Mechanical Works					Civil Works							Electro-Mechanical Works			
	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6	Activity 7	Activity 1	Activity 2	Activity 3	Activity 4
Welding Skills	0.965	1.032	0.81	2.729	1.049	.769	0.835	.837	.795							
Surveyor's Skill		1.189					.744	1.112	1.039	.821	.795		0.816			0.818
Electrician	1.61	0.876	1.115	0.808	1.085			0.979	.942							
Sheet Metal Works			0.916	0.734		.819				.724	.736	.751				0.733
Crane Mechanic	1.068			1.087	0.813	.843		1.018				.720				
Gas Cutter		0.939	0.974		1.323		0.722	1.133	1.152							
Lineman skills	1.196	0.738	1.04				0.845				0.722					
Foundry-man	1.302	0.935	1.077			0.804	.721									
Crane Operating Skills	1.24							.866	0.895	.719	.763					
Wireman Skills	1.154		1.084	0.925											0.795	
Turners Skills	0.725		1.35		0.863			1.163								
Construction Machinery Cum Mechanic		1.21						1.185	1.093				0.77			
Draughtsman (civil) Skills	0.852	1.066										0.761				
Draughtsman (Mechanical) Skills	1.232				0.962				1.069							
Carpenters Skills			0.71										0.732			0.782
Masonry	0.8				1.098	0.748								0.741	0.761212697	
Plumbing Skills								1.17	.780				0.859			
Fitters Skills	0.985															
Storekeeper	0.747															
Operating Skills PLC System										.728						
Welding Skills (Pipes & Pressure Vessel)					1.001											

4.10 FINDINGS – OBJECTIVE 1

In total 16 activity sets are performed during the construction phase of small hydro power project in Uttrakhand. Among these activity sets the "Welding Skills" is considered most significant by 9 activity sets, followed by "Surveyors Skills" which is 8 times among 16 activity set.

The construction of the hydro power plant is done with help of many machines. Hence, for operating these heavy machinery there is huge requirement of skilled labor force. The fact is well known that most of the locations of the hydro power plants are in remote hilly regions and rural areas, for the installation of the power plant is done. It is because of this disadvantageous location, accessibility to the plant is difficult adding to the problem of ability to procure and retain appropriate skilled workforce at the plant site. The construction and installation of the power project requires high skilled and well qualified team of engineers from mechanical, electrical and civil works area. The noted demanding concern that affects the development of required manpower are defined and categorized according to their identified skill gap in form of various types. Three categories have been made to define them:

I. **Skills Gap category "TYPE - A" –** Theskill gaps which fall under the category of type A are usually when, the training methods and educational needs are not properly aligned with the present needs and requirements of the small hydro power industry. The curriculum developed or the course outline along with the pedagogy is not being able to deliver as per the expectations of the small hydro power industry and its current needs. Another gap observed the absence of responsibility towards the needs of an individual and his aspirations to develop the required skills in which he / she would like to expertise is acting as a barrier to impart required training skills. Further these irresponsible attitude is causing poor relationship sharing of the training institutes and the industry causing lack in the required skills of workforce and also leading to poor quality of teachers in the subject area.

II. **Skills Gap category "TYPE - B" –** The skill gaps arising from Type B category, are reflected from the loopholes observed during strategy formulation stage by the contractors in the small hydro power industry sector. The management of the workforce will typically include development of the employees with an aim to reduce the skill gap observed between the present available workforce and the skills required to do the work so that the problem of supply and demand of required skill sets are duly meet. There are many modes and ways in which the activities for the development of skill sets may be mapped. Some noted examples would be of enhancing the job design and recruitment accordingly, assessing the performance and ways for imparting the training and formulation of strategies related to the development of skill and retaining them. One major reason observed in type B skill gap category was that the job design did not robustly match with the skill sets required to perform the task for which staffing needs to be done. Another issue could also be the ineffective structuring of incentives towards individuals who have invested in skills development

III. **Skills Gap category "TYPE - C" –** Type C category of skill gap is amalgamation of type A and type B skill gap categories. It is neither the job design is in accordance with the skill sets required not the training of the applicant is robust enough to perform the required task.

Surveyors Skills -This job role is responsible for carrying out surveying using modern and conventional systems and instruments at a construction site. The individuals should possess sound technical knowledge, should be able to monitor and maintain safe and quality working practices. Few personal attributes job requires the individual to be physically and mentally strong enough to oversee the surveying work at a construction site. The individual should be having strong

organizational, inter-personal and communication skills, along with comprehensive technical knowledge of surveying works and ability to supervise construction crew. Experience desirable is (i) Non trained worker: 15 years site experience in same occupation (ii) Trained worker: 10 years site experience as a certified Helper Surveyor.

Electrician - Performskilledjourney-levelworkinthe construction,maintenance andrepairof electricalandelectronicequipment,apparatusandfixturesusedatpower generationplants. Job of electrician requiresclimbing,standing,bendingandliftingheavyobjectsinawkward andconfinedspacesusingproperliftingandriggingtechniques. They are subjecttoexposuretofumes,dustandhighlevelsof vibration, subjecttoexposuretohighnoiselevelsrequiredear protection, subjecttoworkingnear moving parts ofheavymachineryandhighvoltage equipmentwherethe useof appropriate protective/safetyequipmentis required, Subjecttoworkingatheightsandinadverse weather conditions. Also, Work includesindoor andoutdoor environment which maybe subjecttoafter dutycall-outs.

Sheet Metal Works - Plan,layoutandperform fabricatingandassemblyoperationsonsheetmetalproductswith minimumsupervision;setuandoperatemetalfabricatingmachines;assignwork,instructandtrain lower classification workers. Receivesworkordersandprints,developing sketchesandusingshopcalculationsifnecessary. Usually, usesmachineandhandtoolstocutandform piecestorequireddimensions.Solders,rolls,or rivets seams. He also must performmetalmaintenanceworkandfabricationofequipmentsuchasducts,machineguards, oil pans, chutes, exhaust hoods, conveyors, rain gutters, and the like. Job role requires set up and operating of sheet metal fabricating machines, e.g. shears, brakes, roll formers, nibbling shear,beader,flanger,crimper,punches,drills,etc.,tocut,trim,form,shape andotherwiseprepareparts and sections for assembly.He is responsible for assemblingandfitpartsanddetails usingspotwelders,riveters,solderingequipment,handtools, etc., and check work for dimension and configuration.

4.11 SUMMARY

In this chapter, the study observed the list of skill gap present during the construction phase of the small hydro power plant. The factors those were extracted by using statistical software SPSS 21 version, among these some were similar to those identified from literature review and views of field experts. The correlation matrix, reliability, validity & internal consistency, total variance and rotated component matrix was described in detail. The variables in rotated component matrix of all the activities also show convergence, evident from the factor loading for each variable. Convergent validity in indicated by the high loading within factors, while the absence of cross loading testifies to discriminant validity. Additionally, the factors extracted for each of the variables differ significantly from the others, indicating they are measuring different underlying constructs. It can thus be concluded that the instrument conforms to convergent as well as discriminant validity criteria.

CHAPTER 5 – CASE STUDY ANALYSIS

"…..case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes. In this sense, the case study, like the experiment, does not represent a "sample", and the investigator's goal is to expand and generalize theories (analytic generalization) and not to enumerate frequencies (statistical generalization). " (Yin, 1994, p 10)

5.0 OVERVIEW

In this chapter, the study will describe the analysis of the second objective of the study. The mode of analyzing is case study method. In order to explore the second objective the case study method was considered appropriate for developing a conceptual understanding of how to find out measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand are investigated. Explaining on the basis of the literature in the chapters previously, and the knowledge of the same that has been existing before quotations from the conceptual terminology and theoretical insights that can be used to build an analytical understanding of the activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand. This case study links context to first identify significant skill gaps and then explore measures and scope to reduce the identified skill gaps.

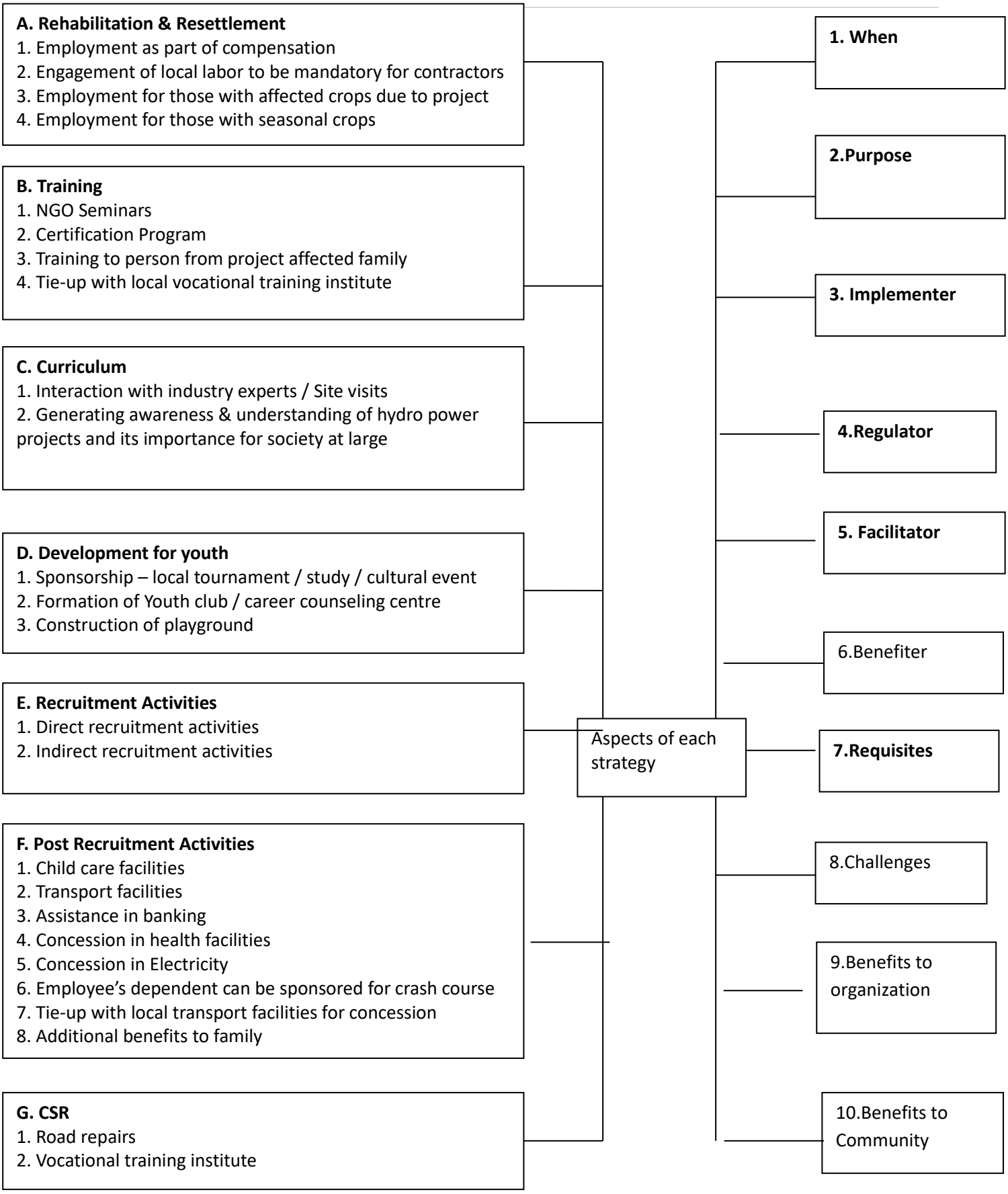
Theoretically and conceptually further the concept of skill gap at small hydro power construction phase is not completely understood. What it misses is the base support of conceptuality informed literature on the adequate skill gap issue and a truly existing and aggregate theory which may be used in analyzing it. A vast and much described literature review in the previous chapters does not provide an acceptable infrastructure on the theoretical basis to reach this aim. On the basis of Yin (1984, 1989, 1993, 1994) it is observed that the methods of case study would specifically suit in a situation where the study have lesser control on the events involved in the case or the phenomena of study is not well known for scrutinizing purpose. Hence, conceptualizing the

measures and scope of social inclusion to solve a problem of compelling skill gap in the small hydro power industry of Uttrakhand is therefore a priority.

5.1 CONCEPTUAL FRAMEOWRK

Our conceptual framework of for identifying measures of social inclusion in small hydro power project in Uttrakhand is illustrated in Figure 5.1. The conceptual framework is based largely on three literature sources, which is to review the various challenges in sourcing skilled Man power : Challenges and Scope , a host of literature related to Role of Social inclusion in Hydro Business Scenario and Measures of Social Inclusion . The particular acumen in the conceptual structure obtained from the literature have been elaborately explained the following sections. The conceptual structure selected to consider the briskly evolving nuances of skill gap issues in the small hydro power projects, seven key constructs underpinning ten aspects of each strategy is informed trough a methodological approach in figure 5.1:. The seven constructs are (i) Rehabilitation & Resettlement (ii) Training (iii) Curriculum (iv) Development for Youth (v) Recruitment Activities (vi) Post- Recruitment Activities (vii) CSR. These seven constructs are mapped with ten aspects explaining in detail when these constructs play the role, what is the basic purpose of these constructs, different mediator required and in which way it will benefit either the organization or the community.

Figure 5.1: Conceptual Lens was designed in 7 parts.



After identifying tools for conceptualization which enable building of an cogent framework which would aid in the process of conceptualization of institutionalization expanding boundaries at the annexation is the major requirement in the thesis. The results of the procedure in institutionalization in farther above interface, where ceremonial policy develops as organizational method 'on the ground', is theoretical over the analytic structure which evolves from the case study. The process of this must be deciphered with reference and theorized in conditions of emphasis of context and process. As a theoretical case study, the thesis conceptualizes the collaboration among the constructs and reconfiguring them with the various aspects of each strategy in which these constructs are required. As the study is principally a concept based approach, hence the method of case study would perform as an interrogative mechanism towards generation of newly constructed theory and concepts from the existing scattered. As each constructs is derived from the literature review, a holistic and contextual analysis is needed to help understand this relation of process to context and structure to action. Boundary work at the skill gap interface is surrounded by ambiguity, involves multiple interests and different stakeholders with different goals and interests while the causal processes linking the iteration of context to process is to be understood from figure no 5.1.

5.1.1 (A) - Rehabilitation & Resettlement

The Rehabilitation arrangement have been predominantly bifurcated as per the Rehabilitation and Urban Rehabilitation policies. Families that were affected beneath Rural Rehabilitation are categorized as "Fully affected" or "Partially affected". The personal who have lost their land more than 50% were treated as Fully Affected. Those families whose less than 50% land is coming under submergence are categorized as "Partially Affected". Figure 5.2 shows conceptualization of the rehabilitation and resettlement process:

Figure 5.2: Constructs of Rehabilitation & Resettlement

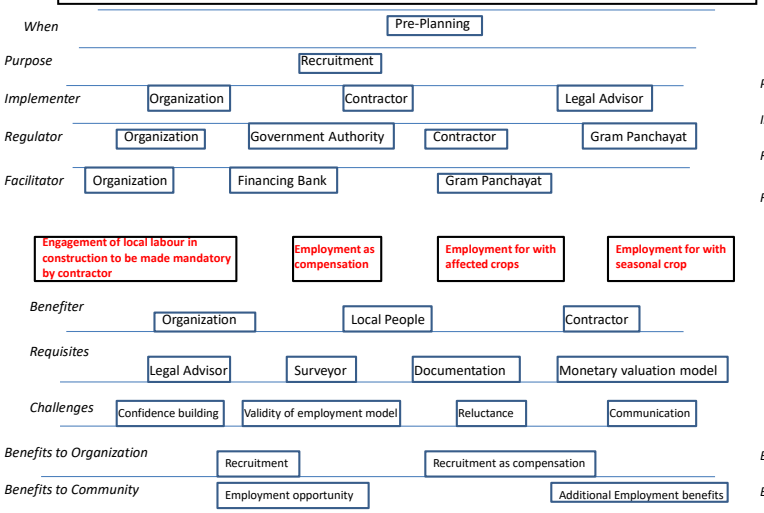


Figure 5.3: Mapping of Constructs of Rehabilitation & Resettlement

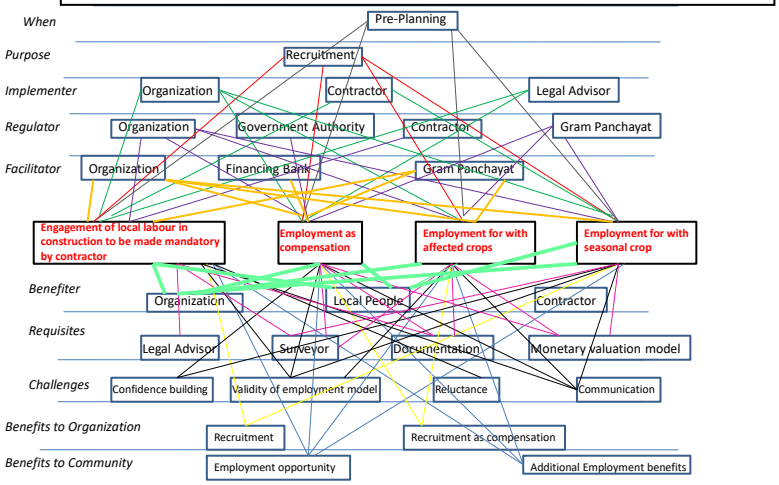


Figure 5.3: shows mapping of the conceptual lens with each aspect of the strategy. We can see that the process of Rehabilitation and resettlement has four key categories along with their relationship with each aspect as mapped is explained in the table below 5.1:

Table 5.1: Mapping of Conceptual lens for Rehabilitation & Resettlement

Rehabilitation & Resettlement	1. Employment as a part of compensation	What/how	There are various ways of compensating to the affected families of the project, one such way proposed is by offering job positions to any dependent of the affected family member. This will aim at sourcing employees from local area and also help the family to earn income.
		Purpose of the measure	Recruitment
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation / Local People
			c) Facilitator - Gram Panchayat / Financing bank / Government authority
			d) Regulator - organisation / Government authority
		When	Pre - Planning stage of project
		Requisites	Surveyors / monetry valuation Model/ Legal Advisors /Funds
		Challenges	Confidence building
			Communication
			Validity of Employment model
			reluctance from HR department and legal advisors to travel to remote locations
			Non cooperation from NGO for benefit of society at large
		Benefits to organisation	recruitment as part of compensation
		Benefit to Community	Employment with additional benefits
	2. Engagement of local labour in construction should be mandatory for contractors	What/how	It should be made mandatory for the local contractors to source some percentage of labour force from the local area to be working during the construction stage. This will give opportunity for local labor to earn livelyhood and also help the in sourcing of manpower problem
		Purpose of the measure	Recruitment
		Who	a) Implimentor - Contractor / Legal Advisor
			b) Befitor - Organisation / Local People / contractor
			c) Facilitator - Gram Panchayat / Financing bank / Government authrity /HR Department
			d) Regulator - organisation / contractor / Gram Panchayat
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Documentation

		Challenges	Reluctance from Contractor
			reluctance from local community
			non- avilablity of skills required
			reluctance from local to learn required skill
		Benefits to organisation	Recruitment
		Benefit to Community	Employment with additional benefits
	3. Employment for those with affected crops	What/how	Crops can be affetcted in two ways, 1. that is permanently damage to the land and crop, so no crop can be grown later. In this case option of giving permannet job with the organisation can be considered. 2. Temporary damage to the crop, that is a particular season's crop is damaged or a for a particular time the crop can not be grown, but has fuure possibility for growing. In this case temporary job can be offered till the land can bear crop again.
		Purpose of the measure	Recruitment
		Who	a) Implimentor - organisation / Legal Advisor
			b) Befitor - Organisation / Local People
			c) Facilitator - Gram Panchayat / Financing bank / Government authrity /HR Department
			d) Regulator - organisation / contractor / Gram Panchayat
		When	Pre - Planning stage of project
		Requisites	Surveyors / monetry valuation Model/ Legal Advisors
		Challenges	Confidence building
			Communication
			Validity of Employment model
			reluctance from HR department and legal advisors to travel to remote locations
			Non cooperation from NGO for benefit of society at large
		Benefits to organisation	recruitment as part of compensation
		Benefit to Community	Employment with additional benefits
	4. Employment for those with seasonal crops	What/how	Most of the Hydro projects are based in himalyan region, here seasonal crops are grown, the off season farmers look for alternative source of income, in such circumstances farmers can be offered temporary jobs with the organization
		Purpose of the measure	Recruitment
		Who	a) Implimentor - organisation / Legal Advisor

			b) Befitor - Organisation / Local People
			c) Facilitator - Gram Panchayat / Financing bank / Government authrity /HR Department
			d) Regulator - organisation / contractor / Gram Panchayat
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Surveyors / HR Department / Contractor
		Challenges	Reluctance from Contractor
			reluctance from local Community
			non- avilablity of skills required
			reluctance from local to learn required skill
		Benefits to organisation	Recruitment
		Benefit to Community	Employment with additional benefits

The Table 5.1 above shows the construct - resettlement & rehabilitation mapped in detail explaining purpose of the constructs and at various levels how it will relate in each aspect of strategy . Resettlement is not just about moving people from one home and environment to another. It also entails ensuring that they are able to provide for and fulfill their families' needs, specially food, clothing and shelter. It, thus, falls on the authorities concerned to make sure that adequate arrangements are made to ensure this in the new area that the community shifts to. It has generally been found that project affected do not end up being project beneficiaries. The fruits of developmental projects are directly enjoyed by the affluent residing in urban areas, rather than those who have sacrificed their homes for the so-called development of the country. Result is that the displaced find themselves doubly exploited – loss of homes, cultures, traditional livelihoods on the one hand and continued deepening poverty on the other, since they are not trained for the jobs that are available.

5.1.2 (B) Training

Figure 5.4 shows conceptualization of the training process, Here four sub constructs were identified during literature review (i) NGO Seminar (ii) Certification program (iii) Training to a person from affected family for sourcing of skilled manpower (iv) Tie-up with vocational training institute for locals.

These constructs are mapped to when these sub -constructs play a significant role to give a benefit to either organization or community with help of certain mediators.

Figure 5.4: Constructs of Training

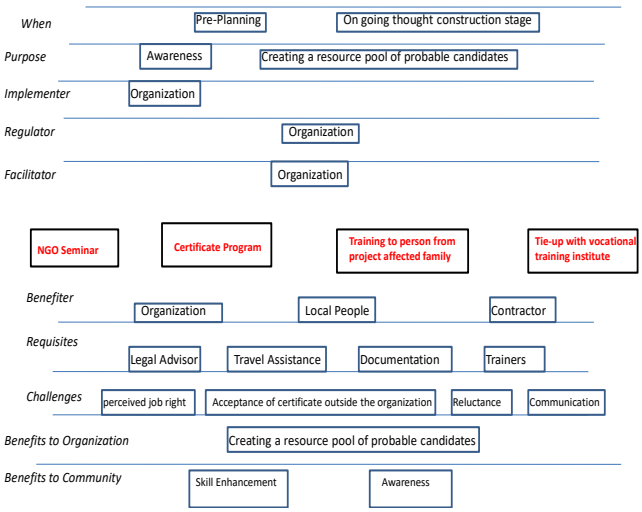


Figure 5.5: Mapping of Constructs of Training

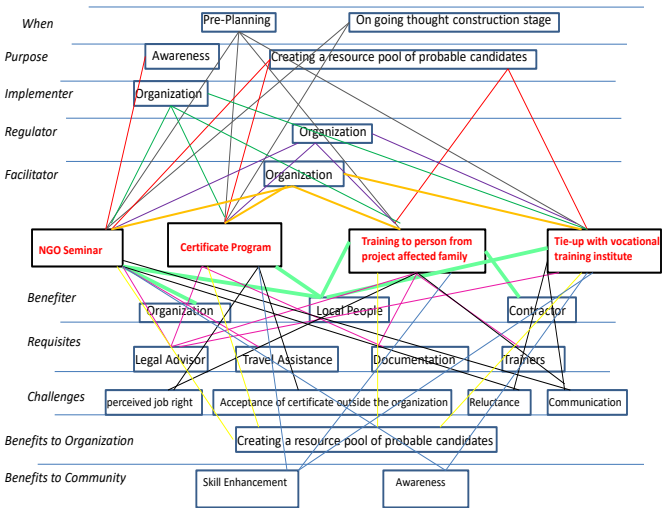


Figure 5.4 shows mapping of the conceptual lens with each aspect of the strategy. We can see that the process of training has four key categories along with their relationship with each aspect as mapped is explained in the table below 5.2:

Table 5.2: Mapping of Conceptual lens for Training

Training	1. NGO seminars	What/how	NGO that are operational in local areas maintain good report with local people. These NGO's have gained confidence of local people and have an influence. The HR officer can visit the NGO and propose to keep a seminar where they can be explained about benefis of the project not only to neaighbouring area but society at large.
		Purpose of the measure	awareness
		Who	a) Implementer - HR Department
			b) Befitor - Organisation /NGO / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Monitoring support / funds /Travel Assistance
		Challenges	Reluctance of ngo
			Reluctance from HR Department to work on field site
		Benefits to organisation	generating acceptance towards the project and sourcing manpower
		Benefit to Community	awarness
	2. Certification programs for skilled workforce in the area	What/how	For the Skilled workorce working within the area (can be with another organisation) our organisation can organise free of cost certificate program for skill enhancement at the site location, once in six months or once in year
		Purpose of the measure	Creating a probable resource pool for future recruitment
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation /NGO / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Funds / trainers / Travel Assistance
		Challenges	Reluctance from current employeer to relive the employee for the course
			reluctance from the skilled workforce
			Reluctance from trainers to travel to site location
			Communication

			acceptance of certificate outside the organisation
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	Skill Enhancement
	3. Traning to a person from affected family for sourcing of skilled manpower	What/how	As part of compensation the organisation wishes to offer job position to a dependent of the affected family persons. But the same may or may not be skilled to execute the job expected, so training must be given to such people as they are probable skilled workforce for the organization
		Purpose of the measure	Recruitment
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation /NGO / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Funds / trainers / Travel Assistance
		Challenges	Reluctance from trainers to travel to site location
			Communication
			reluctance from locals to learn due to consideration of percived job right
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	Skill Enhancement
	4.Tie-up with Vocational training institute for locals	What/how	The HR Department can tie-up with the vocational institutes persent in the local area, and information can be imparted to enhance the skills in the students which are required by the organisation
		Purpose of the measure	Creating a probable resource pool for future recruitment
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation /NGO / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department
		When	Pre - Planning stage of project
			Ongoing activity througout the year

		Requisites	Funds / trainers / Travel Assistance
		Challenges	Reluctance from trainers to travel to site location
			Communication
			reluctance from locals to learn due to consideration of percived job right
			Resistance to learn organisation specific trade
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	Skill Enhancement

If the member of the family who is affected personal and who either himself or wishes to recommend its dependent for courses in training with vocational applications, , the project implementer should organize to impart training which would be suitable. These sort of trainings should be imparted with help of institutes that are existing and working on industry domain areas, like Polytechnic, ITIs. The project authority may meet the cost of training of the persons and will be selected from amongst many land looser families.

5.1.3 (C) - Curriculum

Figure 5.6 shows conceptualization of the importance of having a curriculum to generate interest towards increasing the skills for small hydro power industry. Two sub-constructs were identified (i) Generating awareness & understanding of hydro power projects and its importance for society at large (ii) Interaction with Industry Experts / Teacher's seminar. These sub-constructs were mapped to understand the purpose of these construct, when they would play a role and with help of certain mediators to give benefits.

Figure 5.6: Constructs of Curriculum

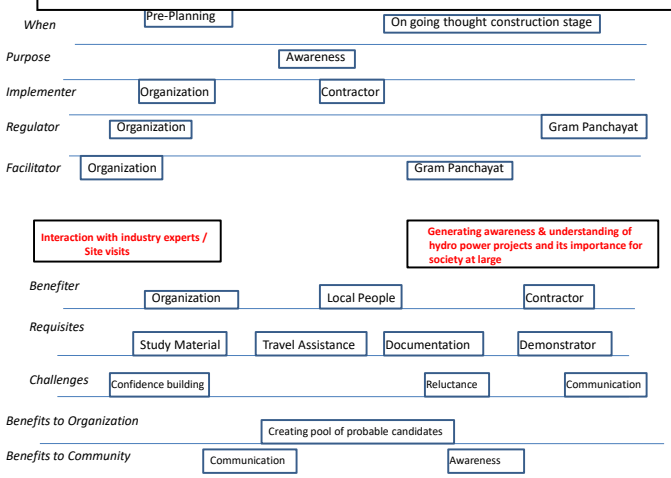


Figure 5.7: Mapping of Constructs of Curriculum

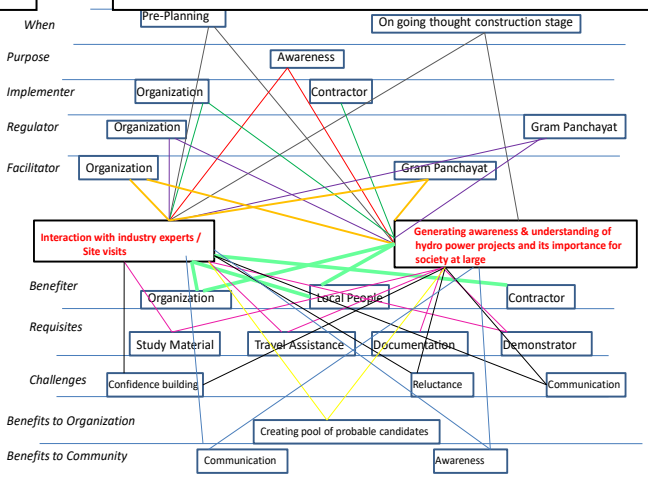


Figure 5.7 shows mapping of the conceptual lens with each aspect of the strategy. We can see that the importance of curriculum has two key categories along with their relationship with each aspect as mapped is explained in the table 5.3below :

Table 5.3: Mapping of Conceptual lens for Curriculum

Curriculum	1.Generating awareness & understanding of hydro power projects and its importance for society at large	What/how	Its will be a co-curricular activity in schools/colleges. The activity can be done one or twice a week, students will be motivated to build renewable energy project model based on their undersstanding, the best model can be awadred.
		Purpose of Measure	Awareness
		Who	a) Implimentor - CSR Department
			b) Befitor - Organisation / School / College
			c) Facilitator - Gram Panchayat / School/ College Authorities
			d) Regulator - CSR Department / School / College Authorities
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Study material/ Monitoring support / funds/ online study material / portal / Simulator games
		Challenges	Reluctance of school / college authorities
			Reluctance from gram panchayat
			demand of monetory benefits to school
			Reluctance from CSR Department to work on field site
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	Awareness
	2. Interaction with Industry Experts / Teacher's seminar	What/how	As a part of co-curricular activity once in session an arrangment can be made where an industry expert meets and disucses the importance of renewable energy projects and their benefits. The expert can evaluate the knowledge of students and satisfy their queries. Similar Seminars can be arranged for teachers.
		Purpose of Measure	Awareness
		Who	a) Implimentor - CSR Department
			b) Befitor - School / College
			c) Facilitator - CSR Department / Site Office supervisor / School/ College Authorities
			d) Regulator - Site Office supervisor / School / College Authorities
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Travel assistance/ study material
		Challenges	Reluctance from students
			Reluctance from industry expert to visit remote location

		Benefits to organization	Creating pool of probable candidates
		Benefit to Community	Awareness / communication

In above table we can see the conceptual lens of the construct – Curriculum explained in detail with respect to the objective of the study. Here, the relationship of construct is mapped with each aspect of the strategy to be used for analyzing the various measures for social inclusion.

5.1.4 (D) - Development for youth

Figure5.8 shows conceptualization of the importance of development of youth activities to generate interest towards increasing the skills for small hydro power industry. Four basic constructs were identified (i) Sponsoring of local tournament/ Sports activity (ii) Formation of Youth Club (iii) Formation of Youth Career counseling centre (iv)Construction of playground for locals. These four sub-constructs are mapped to understand the purpose of each, when they would play the role, with help of certain mediators to give benefits to stakeholders.

Figure 5.8: Constructs of Development of Youth

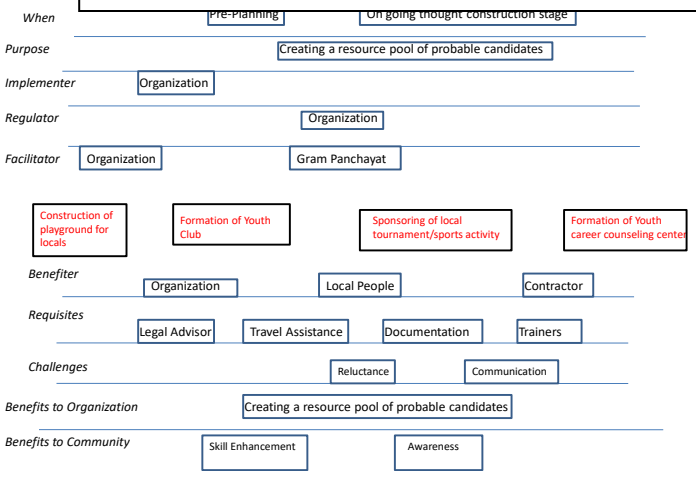


Figure 5.9: Mapping of Constructs of Development of Youth

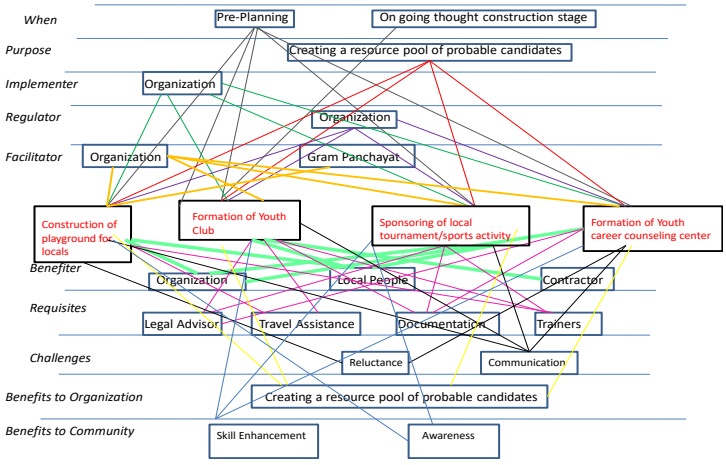


Figure 5.9 shows mapping of the conceptual lens with each aspect of the strategy. We can see that the importance of curriculum has four key constructs along with their relationship with each aspect as mapped is explained in the table below 5.3 :

Table 5.4: Mapping of Conceptual lens for Development of Youth

Development of Youth	1. Sponsering of local tournament/sports activity	What/how	A local tournament or sport can be encouraged and sponsered by the organisation for the youth of the local area with consultation to Gram panchayat. Once a year an annual tournamnt can be organised to promote youth events.
		Purpose of the measure	Creating a probable resource pool for future recruitment
		Who	a) Implimentor - CSR Department
			b) Befitor - Organisation / School / College/ local youth
			c) Facilitator - Gram Panchayat / School/ College Authorities
			d) Regulator - CSR Department / School / College Authorities
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Monitoring support / funds / Sports facilities & equipments
		Challenges	Reluctance of school / college authorities
			Reluctance from gram panchayat
			Reluctance from CSR Department to work on field site
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	motivating the youth and binding them together on a common platform, opportunity to grow additional skill
	2. Formation of Youth Club	What/how	A common platform can be given to youth of the local area to come together for this organisation can either construct a meeting site in the village area or a room/hall on the project site can be given to youth for once a week or once a month to come together.
		Purpose of the measure	Creating a probable resource pool for future recruitment
		Who	a) Implimentor - CSR Department
			b) Befitor - Organisation / School / College/ local youth

			c) Facilitator - Gram Panchayat / School/ College Authorities
			d) Regulator - CSR Department / School / College Authorities
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Monitoring support / funds / construction of youth club site or hall
		Challenges	Reluctance of school / college authorities
			Reluctance from gram panchayat
			Reluctance from parents
			Reluctance from CSR Department to work on field site
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	motivating the youth and binding them together on a common platform, opportunity to grow additional skill
	3. Formation of Youth career counciling center	What/how	Youth and students in remote location site are not much aware of variety of career options avilable to them, career councilling can be promoted to attract youth towards the lucrative career options offered by the organisation.
		Purpose of the measure	Creating a probable resource pool for future recruitment
		Who	a) Implimentor - CSR Department
			b) Befitor - Organisation / School / College/ local youth
			c) Facilitator - Gram Panchayat / School/ College Authorities
			d) Regulator - CSR Department / School / College Authorities
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Monitoring support / funds / Travel Assistance
		Challenges	Reluctance of school / college authorities
			Reluctance from gram panchayat
			Reluctance from Career cuncelors to work on field site
			Reluctance from CSR Department to work on field site
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	motivating the youth and binding them together on a common platform, opportunity to grow additional skill

	4. Consruction of playground for locals	What/how	A common platform can be given to youth of the local area to come together for this organisation can either construct a playground in the village area or on the project site can be given to youth for once a week or once a month to come together.
		Purpose of the measure	Creating a probable resource pool for future recruitment
		Who	a) Implimentor - CSR Department
			b) Befitor - Organisation / School / College/ local youth
			c) Facilitator - Gram Panchayat / School/ College Authorities
			d) Regulator - CSR Department / School / College Authorities
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Monitoring support / funds / Contractor
		Challenges	Reluctance of school / college authorities
			Reluctance from gram panchayat
			Reluctance from CSR Department to work on field site
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	motivating the youth and binding them together on a common platform, opportunity to grow additional skill

Above in table 5.3 the study describes the relationship of the constructs with respect to the case in order to understand the behavior of each sub construct in detail.

5.1.5 (E) - Recruitment Activities

Figure 5. shows conceptualization of the importance of conducting recruitment activities to generate interest towards increasing the skills for small hydro power industry. Two significant sub-constructs were identified (i) Direct Methods (ii) In-direct Methods.

Figure 5.10: Constructs of Recruitment Activities

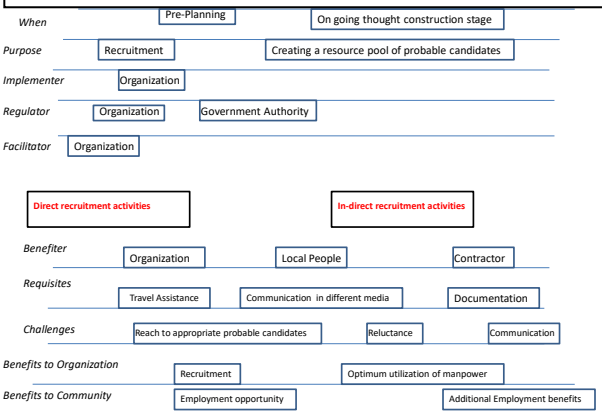


Figure 5.11: Mapping of Constructs of Recruitment Activities

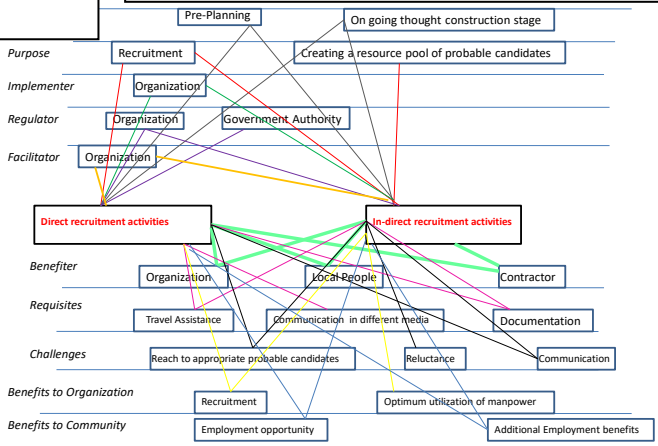


Figure 5.11 shows mapping of the conceptual lens with each aspect of the strategy. We can see that the importance of conducting recruitment activities which has two key constructs along with their relationship with each aspect as mapped is explained in the table below 5.4 . Further their each purpose has been detailed, and understanding was developed to decipher when the sub constructs come in action, with help of certain mediators to eventually give benefits.

Table 5.5: Mapping of Conceptual lens for Recruitment Activities

Ways of Recruitment	Direct Method	Internal	1. Transfer, 2.Promotions 3. Upgrading 4. Existing Employees for permanent position 5. Former employees for part-time /	What/how	Utilizing the workforce resources within the organization to fill the significant gaps at different locations.
				Purpose of the measure	Optimum utilization of existing manpower
				Who	a) Implimentor - HR Department
					b) Befitor - Organisation
					c) Facilitator - HR Department
					d) Regulator - HR Department

			freelance etc 6. Developing multiple skill in existing employees	When	Pre - Planning stage of project
					Ongoing activity througout the year
				Requisites	Active participation from HR department / Employees / departmental heads / Travel Assistance
				Challenges	Reluctance from employees to travel
					Reluctance from departmental heads to relive their department employees
				Benefits to organisation	Optimum utilizaion of existing manpower
				Benefit to Community	Employment Opportunity
		External	1. Advertising 2. Recruitment on open days 3. Internship 4. Local Newspaper 5. Colaboration with local organisations 6. Recruitment from Colleges / ITI / Polytechnices	What/how	The Organisation will analyse the need for employees for certain set of skills, which shall be communicated to HR team for attracting pool of probable candidates through various methods.
				Purpose of the measure	Recruitment
				Who	a) Implimentor - HR Department
					b) Befitor - Organisation
					c) Facilitator - HR Department
					d) Regulator - HR Department
				When	Pre - Planning stage of project
					Ongoing activity througout the year
				Requisites	Active participation from HR department / departmental heads / travel Assistance/ Funds
				Challenges	Cost of communication
					Reach to appropriate probable candidates
				Benefits to organisation	Recruitment
				Benefit to Community	Employment Opportunity
	Indirect Methods	Internal	1. Retired employees 2. Employee refreels 3. Personal Recommendations 4. Dependent & Relatives of decessed employees	What/how	The Organisation will analyse the need for employees for certain set of skills, which shall be communicated to HR team for attracting pool of probable candidates by communicating to the existing employees and consedering recommendations
				Purpose of the measure	Recruitment
				Who	a) Implimentor - HR Department

					b) Befitor - Organisation
					c) Facilitator - HR Department
					d) Regulator - HR Department
				When	Pre - Planning stage of project
					Ongoing activity througout the year
				Requisites	Active participation from HR department / departmental heads / travel Assistance/ Funds
				Challenges	Cost of communication
					Reach to probable candidates
				Benefits to organisation	Recruitment
				Benefit to Community	Employment Opportunity
		External	1. Job Agency/ Outsourcing 2. Employment Exchanges 3. Labour Contractors 4. Internet / local Radio 5. Other Organisations 6 Temporary help agencies 7. Trade associations / Unions	What/how	The organisation can take help of external sources in achieving its target of atrracing skilled workforce
				Purpose of the measure	Recruitment
				Who	a) Implimentor - HR Department
					b) Befitor - Organisation
					c) Facilitator - HR Department
					d) Regulator - HR Department
				When	Pre - Planning stage of project
					Ongoing activity througout the year
				Requisites	Active participation from HR department / departmental heads / travel Assistance/ Funds
				Challenges	Cost of communication
					Reach to probable candidates
				Benefits to organisation	Recruitment
				Benefit to Community	Employment Opportunity

In the table 5.4 above, the intent of mapping activity have been to amalgamate and define various strategy to defeat the barriers of recruitment as mentioned by Dyer and Breja (2000). The objective of this study was to identify the most effective strategies and activities, as reported

by various literature review and reports, for recruiting appropriate manpower into small hydro power projects in Uttrakhand.

5.1.6 (F) - Post Recruitment Activities

Figure 5.12 shows conceptualization of the importance of conducting post - recruitment activities to generate interest towards increasing the skills for small hydro power industry. Seven Sub constructs were identified (i) Child care (crutch) facilities (ii) Transport Facilities (iii) Assistance in opening bank account (iv) Concession in health facilities (v) Concession in electricity bills (vi) Employee & dependents given certified course (vii) Tie-ups with local services

Figure 5.12: Constructs of Post-RecruitmentActivities

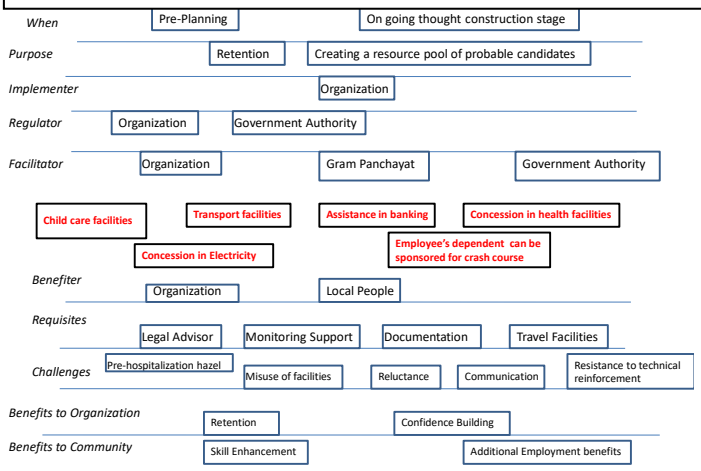


Figure 5.13: Mapping of Constructs of Post-Recruitment Activities

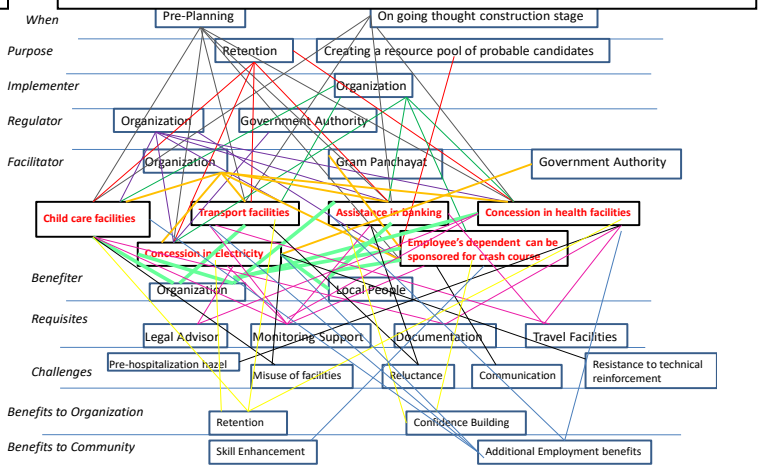


Figure 5.13 shows mapping of the conceptual lens with each aspect of the strategy. We can see that the importance of conducting post - recruitment activities which has seven key constructs along with their relationship with each aspect as mapped is explained in the table below 5.5:

Table 5.6: Mapping of Conceptual lens for post - recruitment activities

Post Recruitment Facilities	1. Child care services given to women employees	What/how	A nursery can be developed and child care services can be offered to women employees. For this just near the site area a room can be designed in children friendly fashion with two attendents for the children.
		Purpose of the measure	Retention
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation /NGO / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department
		When	Ongoing activity througout the year
		Requisites	child friendly zone/ attendents / toys and study material / funds / monitoring support
		Challenges	reluctance from women
			Availbility of Attendent
			Safety of children
		Benefits to organisation	Retention
		Benefit to Community	Additional employment benefits
	2. Transport facilities to work	What/how	Bus/ Shuttle services can be provided to employess to-fro work and home.
		Purpose of the measure	Retention
		Who	a) Implimentor - HR Department / Transpotation department
			b) Befitor - Organisation / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department / Transpotation department
		When	Ongoing activity througout the year
		Requisites	Bus services / Driver / Conductor / Safety officer in-charge
		Challenges	Reluctance from driver
			Additional cost to organization
			Bus service company in local area might object on lowering the business for them
		Benefits to organisation	Retention

		Benefit to Community	Additional employment benefits
	3. Assistance in opening bank accounts	What/how	All workers can be given assitance in opening bank accounts where their salaries can be transferred
		Purpose of the measure	Retention
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department / Gram Panchayat
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Bank person in-charge/ HR department member in-charge / ID cards
		Challenges	Bank person in-charge might be reluctant to travel to remote location
			HR Department person in-charge might be reluctant to travel to remote location
			Lack of faith in banking institutions
		Benefits to organisation	Retention / confidence building
		Benefit to Community	Additional employment benefits
	4. Concession in health facilties to employee and his family	What/how	As a CSR measure the organisation might plan to give hospital facilities to the local community, further rates can be susidies or insureance can be offered to the employees and their families
		Purpose of the measure	Retention
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department / Gram Panchayat
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Medical Insurance agent / HR department / Funds
		Challenges	Reluctance from medical insurance agent to travel to remote locations
			reluctance from HR department in co-ordinating in remote locations
			Pre hospitalization hasels

		Benefits to organisation	Retention / confidence building
		Benefit to Community	Additional employment benefits
	5. Concession in electricity bills to employee and his family	What/how	As a CSR measure Electricity meters can be installed for free of cost for all the houses in the project location site, but additional subsidised rates can be given to the project workers.
		Purpose of the measure	Retention
		Who	a) Implimentor - HR Department / Techinal officer in-charge on site
			b) Befitor - Organisation / local people
			c) Facilitator - HR Department / Techinal officer in-charge on site
			d) Regulator - HR Department / Gram Panchayat / Techinal officer in-charge on site
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Technical officer in-charge/ Surveyors/ HR department actively updating records and informing technical staff
		Challenges	Coordination between HR and Technical Department
			Misuse of facility by local community
			Resistance to technical reinforcement
		Benefits to organisation	Retention / confidence building
		Benefit to Community	Additional employment benefits
	6. Employee & dependents given certified crash course in computer	What/how	For the Skilled workorce or dependents of existing employees working within the organisation can organise free of cost certificate program for skill enhancement at the site location, once in six months or once in year
		Purpose of the measure	easy access to avilable skilled workers and gathering database to probale workforce of the organisation, creating a larger pool of skilled and trained workers
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation /NGO / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Funds / trainers / training facilities /Travel Assistance

		Challenges	Reluctance by the employess for giving extra hours
			reluctance from the parents due to fear of safety
			Reluctance from trainers to travel to site location
			Communication
			acceptance of certificate outside the organization
		Benefits to organisation	Creating pool of probable candidates / Skill Enhancement
		Benefit to Community	Additional employment benefits / Skill Enhancement
	7. Tie-ups with local Bus services to near by town to give subsidised rates to organisation employees	What/how	The organisation can tie-up with local bus service providers to give subsidised rates to organisation employees and their dependents
		Purpose of the measure	Retention
		Who	a) Implimentor - State transportation / CSR Department
			b) Befitor - Organisation / Local People
			c) Facilitator - Gram Panchayat / Government authority /CSR Department
			d) Regulator - organisation / State transportation / Gram Panchayat
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	ID cards / state transport facilities
		Challenges	Reluctance from state transport department
			Reluctance from organisation staff to co-ordinate
		Benefits to organisation	Retention / confidence building
		Benefit to Community	Additional employment benefits

Human assets cannot be owned, they must be nurtured to develop their allegiances with the organization. Thus, post recruitment facilities help us in doing so.

5.1.7 (G) - CSR Activities

Figure 5.14 shows conceptualization of the importance of conducting CSR activities to generate interest towards increasing the acceptance for small hydro power industry. Two sub- constructs identified (i) Repairing of Roads (ii) Construction of Vocational training institute for locals.

Figure 5.14: Constructs of CSR

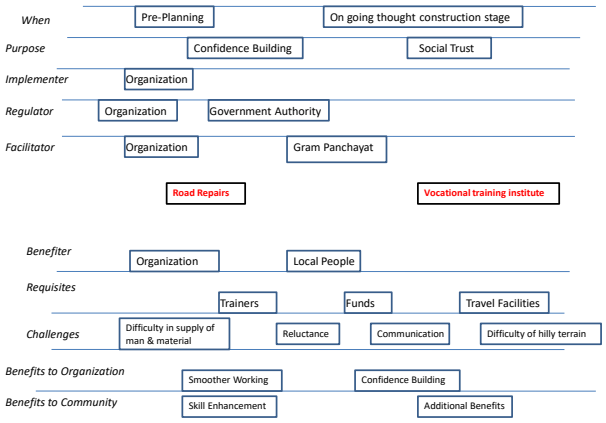


Figure 5.15: Mapping of Constructs of CSR

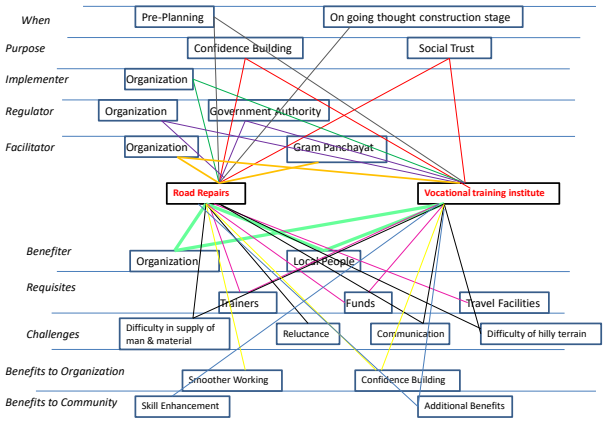


Figure 5.15 shows mapping of the conceptual lens with each aspect of the strategy. We can see that the importance of conducting CSR activities which has two key constructs along with their relationship with each aspect as mapped is explained in the table below 5.7:

Table 5.7: Mapping of Conceptual lens for CSR activities

CSR	1. Reparing of Roads	What/how	As a CSR measure roads through the village towards the site location can be rapaired, this will give acess of better roads to villagers and movement to location site will be quicker and safer for the organization
		Purpose of the measure	
		Who	a) Implimentor - Contractor / Legal Advisor/ CSR Department
			b) Befitor - Organisation / Local People / contractor
			c) Facilitator - Gram Panchayat / Financing bank / Government authrity /CSR Department
			d) Regulator - organisation / contractor / Gram Panchayat

		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Funds / Contractor
		Challenges	Reluctance from CSR Deppartment people to travel to location site
			Difficulty in supply of man & material
			Difficulty of hilly terrain
		Benefits to organisation	Smoother operations / Confidence building
		Benefit to Community	Local area enhancement
	2. Construction of Vocational training institute for locals	What/how	Vocational Training institutes can be constructed where the organisation can train the locals as per the skill requirments of the organization
		Purpose of the measure	Creating a probable resource pool for future recruitment
		Who	a) Implimentor - HR Department
			b) Befitor - Organisation /NGO / local people
			c) Facilitator - HR Department
			d) Regulator - HR Department
		When	Pre - Planning stage of project
			Ongoing activity througout the year
		Requisites	Funds/ Trainers / Trainig Facilities / Travel Assistance
		Challenges	Reluctance from trainers to travel to site location
			Communication
			acceptance of certificate outside the organization
			reluctance from locals to learn due to consideration of percived job right
			Reluctance from parents due to safety issues
		Benefits to organisation	Creating pool of probable candidates
		Benefit to Community	Skill Enhancement

Any development activity can be implemented successfully only by active involvement of the beneficiaries from an early stage of project preparation. In the projects, where there are adverse impacts and loss of assets, the involvements of affected persons assume more significance. In this conceptualization, the study shows the affected persons to be consulted during the socioeconomic survey. Further, the study would undertake the disseminate information and

mitigation measures to the entitled persons affected by the project. The analytical essence of the study are to understand and record observations by individuals in qualitative manner (Guba & Lincoln, 1989). The aim of this research was to examine measures and scope of social inclusion in the small hydro power project of Uttrakhand. The aim is recording of robust and rich facts of the situation and not just superficiality of it. The information that the study wishes to observe should be in reach of reasons as to why and how the outcomes that result in shared interest must be collaborated. These factors are subjective in nature, and belong to people and their perception. The perceptions of different stakeholders are considered for the study. Therefore this research is qualitative where the findings are constructed by the researcher.

5.2 STRUCTURE OF CASE STUDY ANALYSIS

The structure of case design is given under :-

Case 1: Project Name – Madhmaheshwar, 15MW (Rudrprayag)

Unit of Analysis :plant

Level of Analysis :

1. Employees of Uttrakhand Jal Vidyut Nigam Ltd.
2. Labour Union Members of small hydro power sector in Uttrakhand
3. Contractors of Small Hydro Power sector in Uttrakhand
4. Gram Panchayat Members – Rudrprayag

Case 2 : Project Name – Kaliganga-II, 4.5MW (Rudrprayag)

Unit of Analysis :plant

Level of Analysis :

1. Employees of Uttrakhand Jal Vidyut Nigam Ltd.
2. Labour Union Members of small hydro power sector in Uttrakhand
3. Contractors of Small Hydro Power sector in Uttrakhand
4. Gram Panchayat Members – Rudrprayag

Above two cases have been studied separately and cross case analysis of both the small hydro power plant have been conducted. Three Levels are selected to cover employee levels exists in the company i.e, junior level, middle level management and senior level management. Similar and dissimilar measures and scope have been derived from the inferences of case study 1& case study 2.

5.3 SAMPLING

Theoretical method of sampling was selected for this study. For data sample, significant skill gaps were identified in the previous chapter using factor analysis (SPSS, 21). Based on our constructs obtained from literature review, and the identified significant skill gaps, the study wanted to search for measures and scope of social inclusion in small hydro power projects so that the problem of significant skill gaps may be addressed. For this purpose, Employees of Uttrakhand Jal Vidyut Nigam Ltd., Labour Union Members of small hydro power sector in Uttrakhand, Contractors of Small Hydro Power sector in Uttrakhand and Gram Panchayat Members – Rudrprayag; were interviewed. The name and contact details of the personal were

obtained telephone directory available at UJVNL's Intranet/ Website. And, finally interview's were conducted to the personal's whose profile is mentioned in table 5.8 below :

For this respondents were categorized into 4 parts to know their view point on the topic :-

Table 5.8: List of Respondents

Project 1- Madhmeshwar		**Project 2- Kaliganga II**	
Types of Respondents	**No. of Respondents**	**Types of Respondents**	**No. of Respondents**
Organizational Implementers	6	Organizational Implementers	6
Labor Union Members	6	Labor Union Members	6
Contractors	5	Contractors	5
Gram Panchayat Members	3	Gram Panchayat Members	3

Table 5.9: Profile of Respondents

Types of Respondents	**Experience**	**Expertise**
Organizational Implementers	8+ years	Civil Works - Execution Process
	8+ years	Electro-Mechanical Works - Execution Process
	8+ years	Hydro-Mechanical Works - Execution Process
Gram Panchayat Members	6+ years	Local Affairs
Labor Union Members	8+years	Civil Works - Execution Process
	8+years	Electro-Mechanical Works - Execution Process
	8+years	Hydro-Mechanical Works - Execution Process
Contractors	5+years	Construction & Execution works Small Hydro Power projects

We can see in the above table5.8, the List of respondents in Case 1& Case 2. For the interviewing purpose, the organizational implimentors and Labor union members were 6 respondents each in Case 1 & Case 2. While contractors were 5 in Case 1 & Case2. Further the members of Gram Panchayat were 3 each in Case1 & case2. In table 5.9 we can see the profile of each respondent, who has vast expirence in the field of small hydro power plant of Uttrakhand.

5.4 CASE STUDY PROTOCOL

From the point of view of single data point, the case study protocol has been developed which is single respondent. A certain set of procedures and rules according to guidelines are to be followed for the case study protocol (Yin, 2003). It is directed towards the researchers' instead of the focal point in study; also as per Yin (2003) using a case study protocol is imperative in case of multiple case researches. As per the established guidelines laid down by Yin, the case study protocol in the study was advanced. The draft case study protocol was presented to the area experts at UJVNL. Further, the feedback from the experts on these constructs were taken and duly incorporated in the finalization of case study protocol. (Detailed Case study Protocol attaches in Appendix)

5.5 DATA COLLECTION METHOD

"Immerse in detailed were specifics in the data to discover important categories, dimensions, and interrelationships; exploring genuinely accessible investigation instead of examining theoretically derived hypothesis' (Patton, 1990). In accordance the data has been collected for the study have been analyzed and interpreted inductively. Further, qualitative data is "detailed, thick description, inquiry in depth, direct quotations capturing people's personal perspectives and experiences".(Patton, 1990). The advantages of conducting case study method has allowed the researcher to systematically collect data, organize it, and comprehend in order to ensure in-depth information in case 1 & case 2. Also, it allowed the researcher to collect the interviewees experiences in their own language (Eisenhardt, 1989, Yin , 2003). Aforementioned ways would assure validation in research outcomes with help of triangulation of data which was recorded using multiple sources. Data was gathered in case 1 & case 2with help of majorly four techniques: observation of the respondents, interview, discussions done informally, and factual

documents. Observation was made which focused on the factors of the study by the significant respondents who take part directly or indirectly (Pettigrew, 1997). During the study, notes were detailed and penned down of all the interactions with the respondents wherever it was possible.

The data was collected from the identified respondents using case study protocol. A case study protocol is a evidence which consist of the question nary for collection of data along with the process followed and guidelines which are followed while using the protocol. While at the stage where the data is collected, construct validity was persistently analyzed several times and reliability was established with help of case study protocol (Yin, 2003). In section 5.4 Case Study Protocol which was pre-owned in the study for the purpose of interview discussed elaborately. The elaborate details in the case study protocol were advanced prior to collection of the data and semi- structured interviews with the respondents of the Case1 & case 2 were conducted.

Before the commencement of the interview process, the personals who were interviewed were explained that the case study material and the interview data would be used in two ways: (i) To understand the various measures of social inclusion for decreasing the skill gap at the construction stage of the small hydro power plant in Uttrakhand. (ii) to use data for a case publication in thesis, conference, papers, and a book. A brief introduction was also given to the interviewee about the case study research based on the framework given above.

The interview was conducted at four levels to collect data for the study of understanding and finding various measures of social inclusion for decreasing the skill gap at the construction stage of the small hydro power plant in Uttrakhand. The four leves are :

1. Employees of Uttrakhand Jal Vidyut Nigam Ltd.

2. Labour Union Members of small hydro power sector in Uttrakhand
3. Contractors of Small Hydro Power sector in Uttrakhand
4. Gram Panchayat Members – Rudrprayag

The time period for each interview was between 30 to 60 minutes. Proper recording and transcription of the interview was done. The personal who were interviewed were shown the scripts of the interview, with the questions that were followed up. The table below summarizes the main steps in data collection for Case 1 & Case 2.

Table 5.10: Steps in data collection

Steps in data collection	**Case 1**	**Case 2**
Development of case study protocol (CSP) and review and final CSP development	✓	✓
Initial contact and arrangements	✓	✓
Data collection interviews	✓	✓
Site visits for field observation	✓	✓
Review of case report for internal validity	✓	✓
Additional data collection	✓	✓
Total number of interviews	✓	✓

5.6 DATA ANALYSIS STRATEGY

A methodological examination and review of the data set for the purpose of presentation and interpreting of the same is the major aim of case study inspection. The major threats in data set and its analysis are 'make sense of massive amount of data, reduce the volume of information, identify significant pattenrs, and construct a framework for communicating the essence of what the data revels' (Patton, 1990). The study's perceptions and explanation of the development is the base of data set analyzing in the study. The explanation would be instinctive on the the basis on the respondents prior experience in the situation. Like kinds of approaches are classified to modify in terms of grounded theory (Locke, 2001; Charmaz, 2006).

Within the case analysis would help in organizing singular case set for deeper study and organize the stunning quanity of data (Eisenhardt, 1989). Post completing the individual data in case its collection and analysis, the study would carry on cross-case pattern examination from qualitative data sets. These patterns are such as categories, codes, dimensions, and theme/scheme classifications (Patton, 1990). The initial conceptual constructs identified for conceptual lens are the basis for categories to search within – case similatrities and between case differences. Data Analysis has been carried out with the Textual Anlaysis and cross case synthesis. Textual analysis has been done with the help of Atlas ti 7.0 software; network diagrams have been formulated with the necessary quotations and frequency analysis.

5.6.1 Analysis of data with help of 'The modified grounded theory'

Analyzing the data with help of modified grounded theory is considered to be an extremely constant process which involves movment among the data that has been interviewed, theory which is already existing and keen observation (Strauss). Following three steps were used iteratively for conducting data analysis:

1. In Vivo Coding
2. Open Coding
3. Axial Coding
4. Focused / selective coding

The first two steps helped in exploring and understanding the nature and scope of social inclusion during the construction phase of the small hydro power plant in Uttrakhand by developing codes, categories and concepts of social inclusion during the construction phase of the small hydro power plant in Uttrakhand. The last step helped in identifying the factors contributing to the selection of various measures of social inclusion during the construction phase of the small hydro power plant in Uttrakhand. Details of these activities are given below:

5.7 CASE 1 – MADYAMAHESHWAR SHP (OVERVIEW)

The Madhyamaheshwar Small Hydel Project is located over a river which has similar name to the project. The location of the project is in Ukhimath tehsil of Rudraprayag district of Uttarakhand. There is a proposal to install project with a capacity of 20000 KW in a combination

of (04) units of 5000 KW. The power project perceived to be a project which is run of the river with no storage.

The diversion weir is located in Mansuna village just after the confluence of a small tributary Kyar Gad and Madhyamaheshwar Ganga, which is 200 m downstream of the bridge near Buruwa village on the river on Madhyamaheshwar Ganga and the power house is located on left bank of the river just after its confluence with river Mandakini near village Chunni.

The Madhyamaheshwar Ganga SHP has been proposed to be developed for augmenting the power generation in Uttarakhand especially using renewable energy source and for helping in rural electrification of the State. After commissioning of the Madhyamaheshwar Ganga Small Hydroelectric Project, the electrical energy produced shall be utilized for augmenting the energy supply in the local rural distribution network around Ukhimath, Guptakashi, Mansuna, Giriagaon etc. and higher reaches and may provide electricity to un-electrified villages of Kedarnath valley. The energy availability will also improve the voltage profile and reliability of the power system in this remote area in and around holy places like Madhyamaheshwar.

5.8 CASE 2 – KALIGANGA II SHP (OVERVIEW)

The Kaliganga-II Small Hydel Project is located on the river Kaliganga just upstream of Kalimath temple in the Rudraprayag district of Uttarakhand. It is proposed to have an installed capacity of 6750 Kwe with three (03) units of 2250 Kwe project. The project has been conceived as a run of the river project without any storage. The diversion weir is located just downstream of the confluence with Mandani Ganga near Koti Maheswari temple and about 8 kms from Kalimath and about 18 kms from Guptkashi. The proposed power station is now proposed below

the village Kavilta about 400 metre upstream of old power house on right bank of river Kaliganga at a distance of about 13 km from Guptkashi.

The Kaliganga-II SHP has been proposed to be developed for augmenting the power generation in Uttarakhand especially using renewable energy source and for helping in rural electrification of the State. After commissioning of the Kaliganga-II Small Hydroelectric Project, the electrical energy produced shall be utilized for augmenting the energy supply in the local rural distribution network around Kalimath, Jaltalla, Kavilta, and higher reaches and may provide electricity to remote villages like: Chillond, Chaumasi, Bhooni, Daba etc. The energy availability will also improve the voltage profile and reliability of the power system in this remote area in and around Gaurikund and Holi places like Kedarnath.

After the brief overview of case 1 & case 2, the study marches towards the steps of coding to perform the data analysis process.

5.9 IN VIVO CODEING

Code In vivo is also called the ‘Literal Coding’ and ‘Verbatim Coding’ as few methods mentioned in some literature. With reference to the study, code In vivo is used being the most significant label. The roots of the word In vivo means "in that which is alive," and the code it directs towards being a short phrase or words that are deciphered from the language observed in the qualitative data records, "the terms used by [participants] themselves" (Strauss, 1987, p. 33). Confederation or primitive terms would be party derived terms of culture in a particular nature Folk terms indicate the existence of the group's cultural categories (McCurdy, Spradley, & Shandy, 2005, p. 26).

5.9.1 Functioning of Code In Vivo

Coding done through In vivo is essentially for qualitative study, but more specifically for the purpose to begin the qualitative research in order to learn ways to code the data, and research that compute and respect the respondent's responses. In Vivo Coding is one of the methods to employ during grounded theory's Initial Coding but can be used "with several other coding methods in this manual. In Vivo Coding is also quite applicable to action research (Stringer, 1999) since one of the genres primary goals is to frame the facilitator's interpretations of terms "that participants use in their everyday lives, rather than in terms derived from the academic disciplines or professional practices" Below in Figure 5.16 , illustrates the example of In Vivo Coding process done during the study.

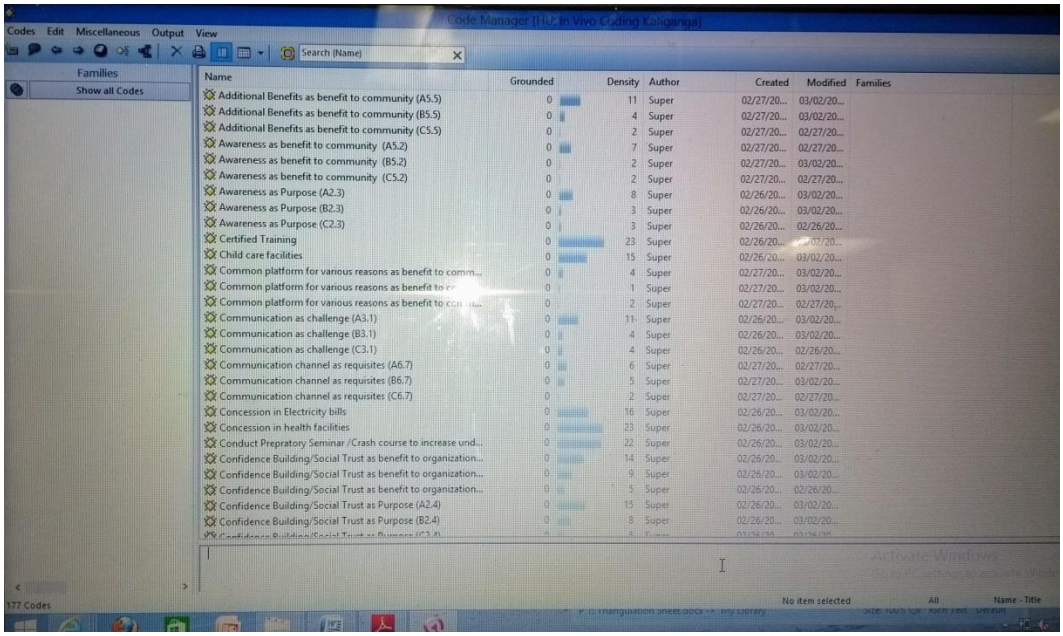


Figure 5.16: Example of In Vivo Coding process

5.10 OPEN CODEING

The data which needs to be input must be selected; classified, and collaborated in order to discern essential theory with help of open code method. Moreover, it would be used to point out the consistant constructs. Some components of the censure or account (Strauss & Corbin, 1990) (i) the measures of social inclusion during the construction phase of the small hydro power plant in Uttrakhand (ii) measures of social inclusion and aspects of strategy to execute the measures (iii))the relationship between measures of social inclusion and the factors of aspects of strategy to execute the measures of social inclusion accredited with label so that easier retrieval and organization (Miles & Huberman, 1994)with help of open coding method (Strauss & Corbin, 1990). The study examines possible theme by putting together some examples cited within text, which is called the process of open coding (Ryan & Bernard, 2000). Open code entails that the code is observed from the data that is empirical in nature. The codes which are new and creation of them serves as evidence (for example issues, themes) appears from within the data. The open code would be utilized to examine the occurrence of new construct (Strauss & Corbin, 1990).

5.10.1 Open Coding : Case 1- Madyamaheshwar – Respondents are Contractors

Figure 5.17 as illustrated down below demonstrates ways by which the open codes were formed from within the statements made by respondents at interview time. As an example, the study observed that some words from the paragraphs were 'reference',' skilled at local work site','Preference' illustrates the measure methods (explains initial conceptual construct – measures tactics), therefore, in open coding steps were marked as codes. Similarly, phrases 'Preference is given to the one who are skilled at local work site' illustrate about the scope of social inclusion and is therefore marked as codes.

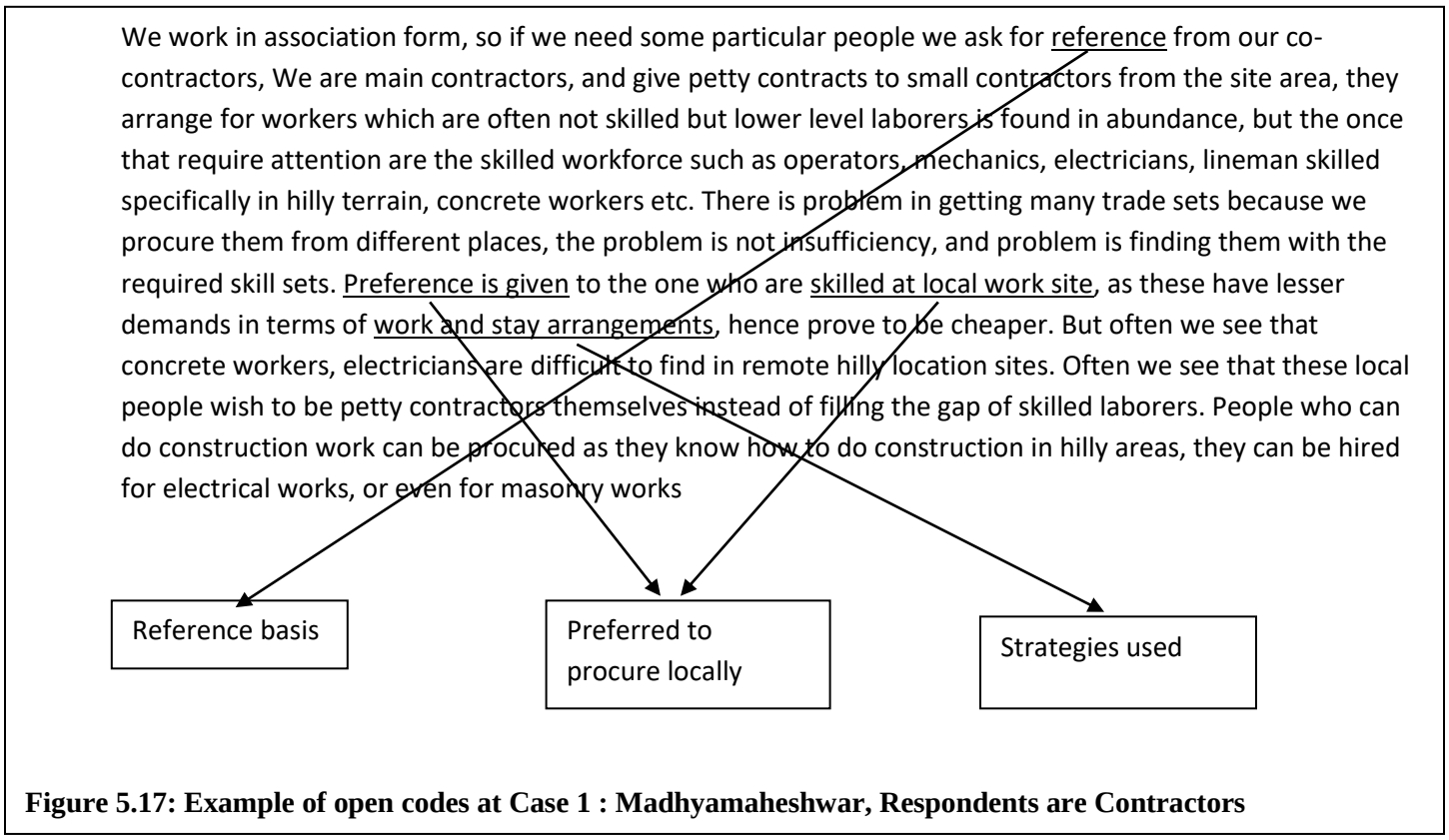


Figure 5.17: Example of open codes at Case 1 : Madhyamaheshwar, Respondents are Contractors

5.10.2 Open Coding Case 1- Madyamaheshwar – Respondents are Gram Panchayat

Figure 5.18 as illustrated down below demonstrates ways by which the open codes were formed from within the statements made by respondents at interview time' steady income', 'facilities should be extended to the local people', 'some opportunity or other livelihood ways' As an example, the study observed that some words from the paragraphs were (explains initial conceptual construct – measures tactics), therefore, in open coding steps were marked as codes. Similarly, phrases 'those facilities should be extended to the local people, also more opportunity related to training or learning centre should open for women and children in local area ' illustrate about the scope of social inclusion and is therefore marked as codes.

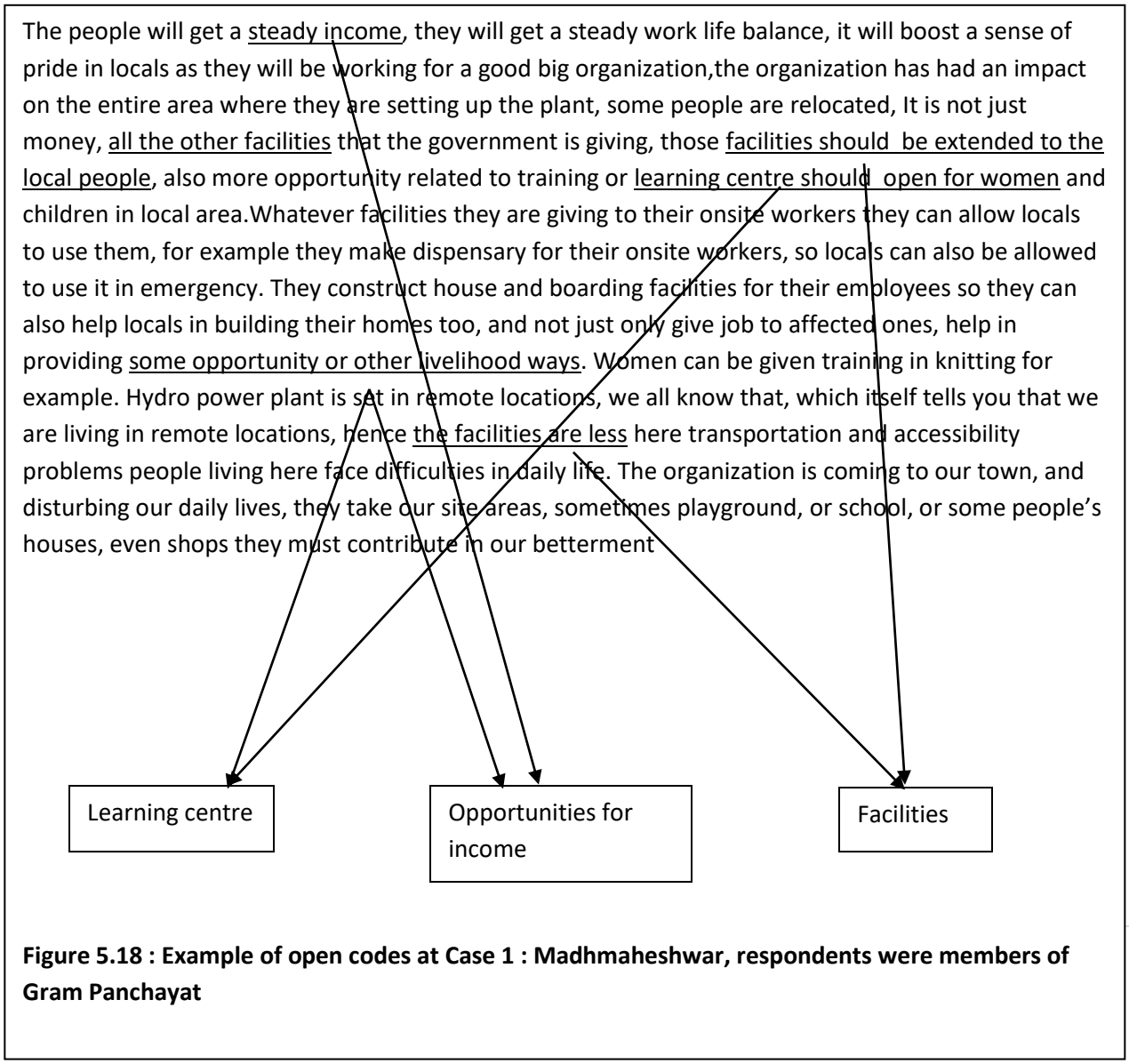


Figure 5.18 : Example of open codes at Case 1 : Madhmaheshwar, respondents were members of Gram Panchayat

5.10.3 Open Coding Case 1- Madmaheshwar – Respondents are Officers at UJVNL

Figure 5.19 as illustrated down below demonstrates ways by which the open codes were formed from within the statements made by respondents at interview time 'hiring by HR Department, alternative source of income', offered temporary jobs', As an example, the study observed that some words from the paragraphs were Similarly, phrases 'In case of regular positions, the organization must plan in advance because the written examination is conducted and hiring done on the basis of merit. But for Contracted employees that are through OPNAL' illustrate about the scope of social inclusion and is therefore marked as codes.

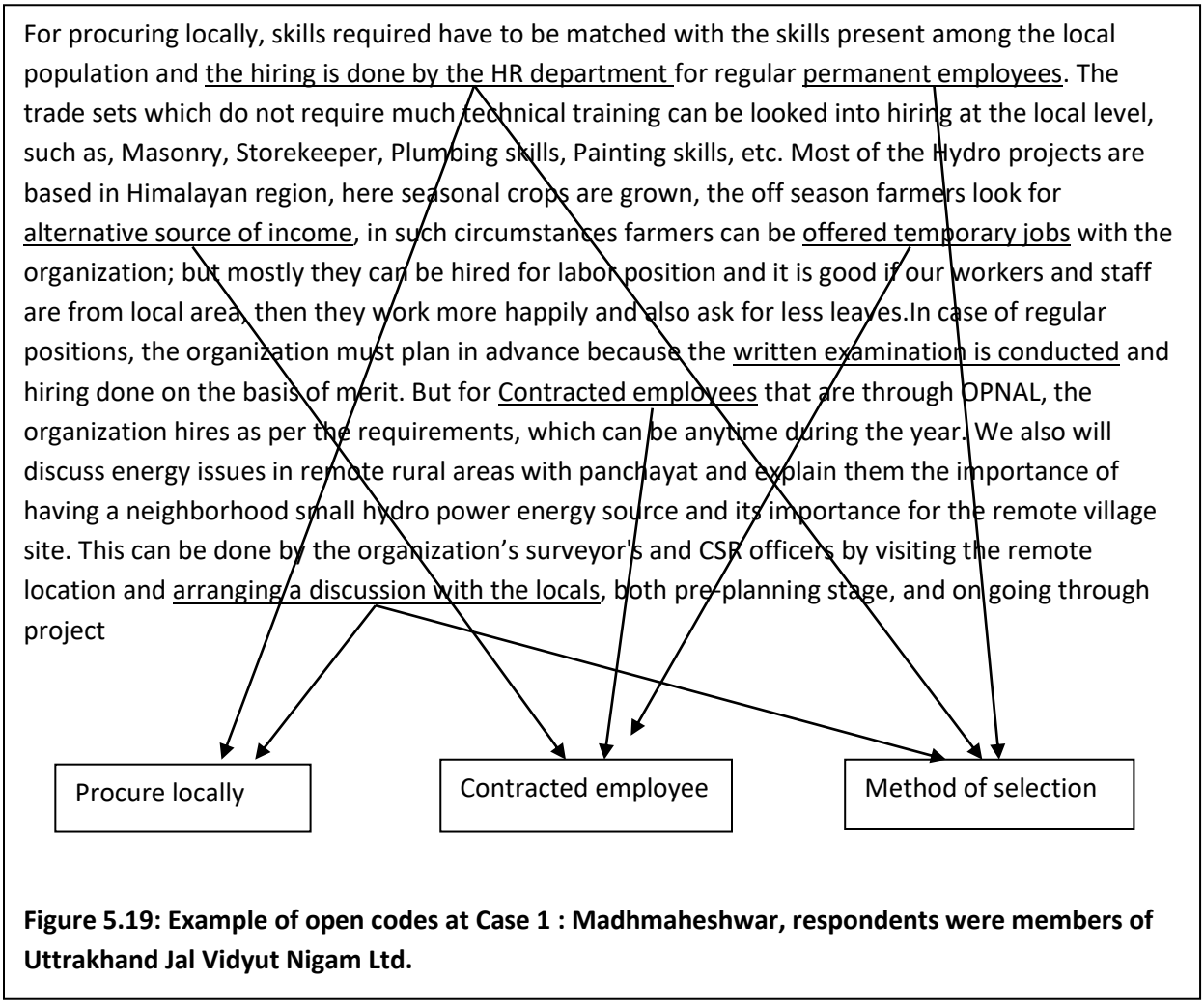


Figure 5.19: Example of open codes at Case 1 : Madhmaheshwar, respondents were members of Uttrakhand Jal Vidyut Nigam Ltd.

5.10.4 Open Coding Case 1- Madmaheshwar – Respondents are members of Labor Union

Figure 5.20 as illustrated down below demonstrates ways by which the open codes were formed from within the statements made by respondents at interview time' 'the existing employees can refer a person ',' refer a person', 'preference' As an example, the study observed that some words from the paragraphs were. Similarly, phrases 'to convert this large number of people into required skilled workforce' illustrate about the scope of social inclusion and is therefore marked as codes.

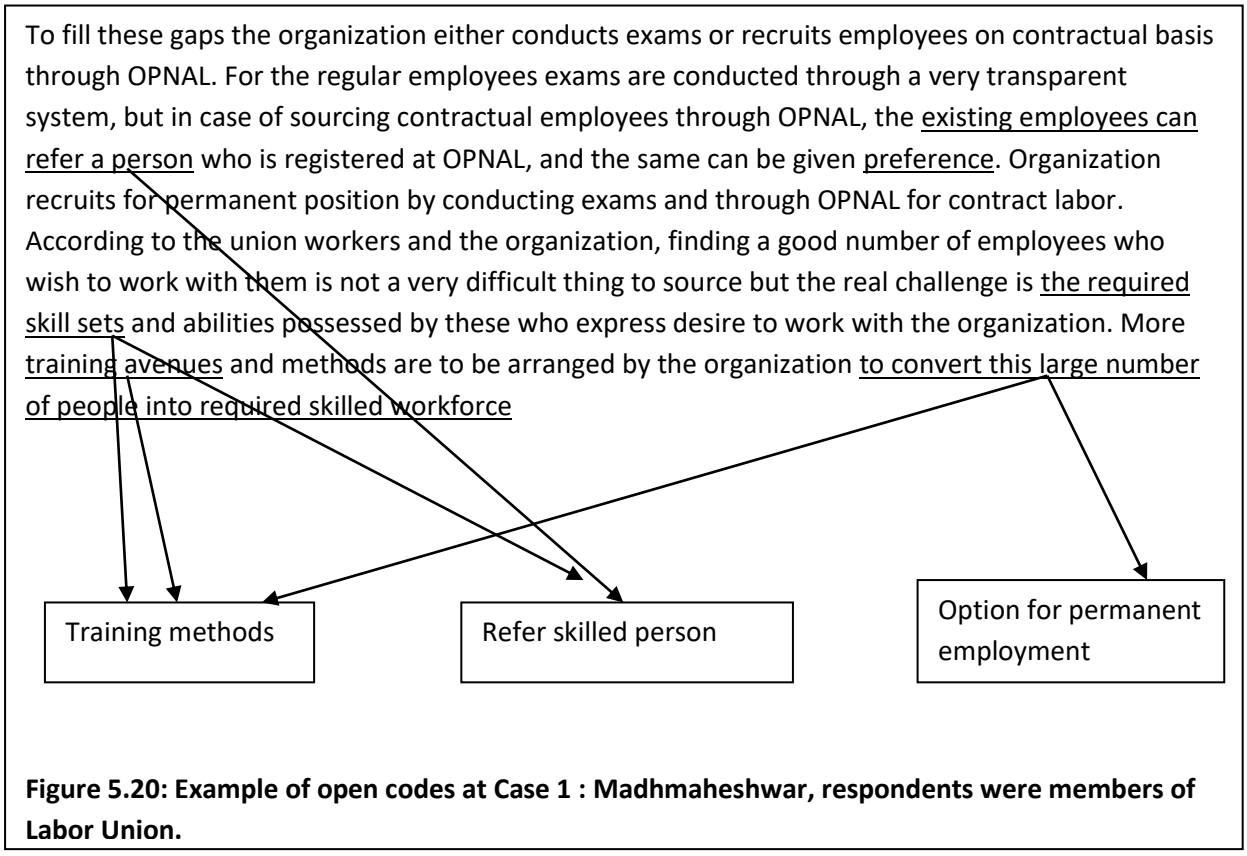


Figure 5.20: Example of open codes at Case 1 : Madhmaheshwar, respondents were members of Labor Union.

Interview scripts coding was done through Qualitative analysis software Atlast ti 7.0. This software enabled the data analysis process by helping with coding, linking codes and text segment, creating memos, searching, editing, and reorganizing, and for visual display of data and findings (Miles & Huberman, 1994; Weitzman, 2000 ; Creswell, 2007).

5.10.5 OPEN CODE - Case 2- Kaliganga II – Respondents are Contractors

Figure 5.21 as illustrated down below demonstrates ways by which the open codes were formed from within the statements made by respondents at interview time' 'Preference',' skilled at local work site','As an example, the study observed that some words from the paragraphs were Similarly, phrases 'difficult to find in remote hilly location sites ' illustrate about the scope of social inclusion and is therefore marked as codes.

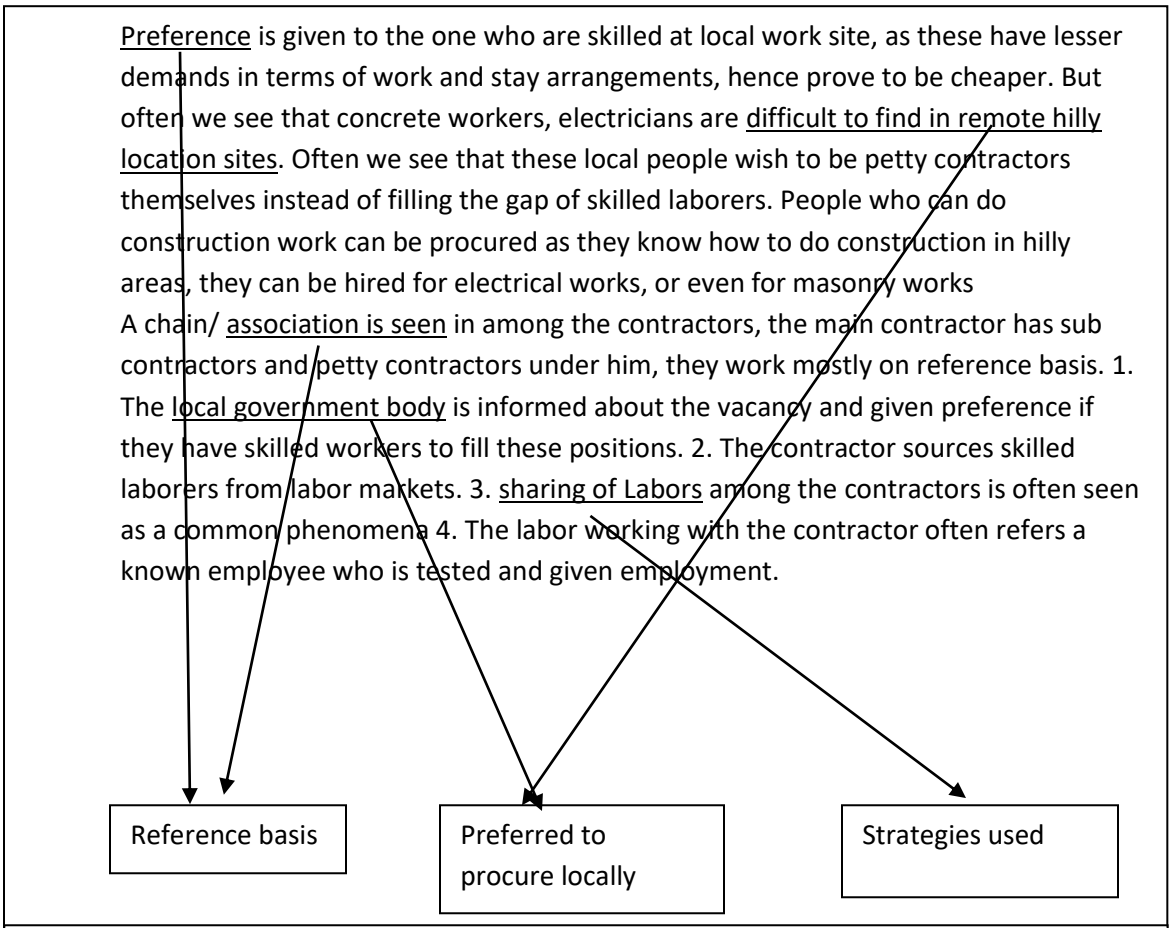


Figure 5.21 : Example of open codes at Case 2 : Kaliganga II - Respondents are Contractors

5.10.6 Open Coding Case 2- Kaliganga II – Respondents are Gram Panchayat

Figure 5.22 as illustrated down below demonstrates ways by which the open codes were formed from within the statements made by respondents at interview time' steady job opportunity, 'facilities, 'not have to shift their base 'As an example, the study observed that some words from the paragraphs were Similarly, phrases 'they will not have to shift their base and migrate with their family to an unknown location ' illustrate about the scope of social inclusion and is therefore marked as codes.

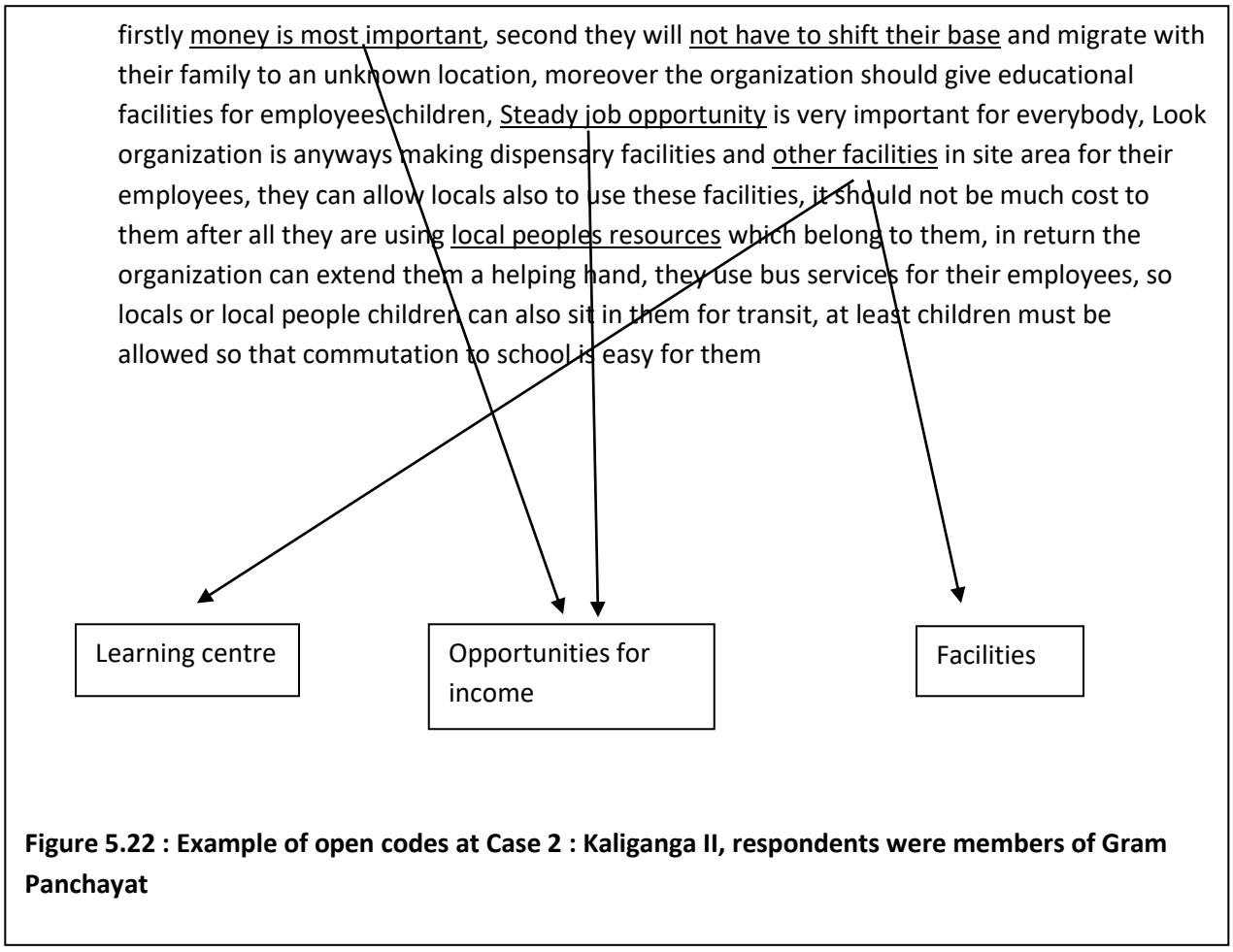


Figure 5.22 : Example of open codes at Case 2 : Kaliganga II, respondents were members of Gram Panchayat

5.10.7 Open Coding Case 2- Kaliganga II – Respondents are Officers at UJVNL

Figure 5.23 as illustrated down below demonstrates ways by which the open codes were formed from within the statements made by respondents at interview time' pre planned', 'process of conducting exams ', 'offered temporary jobs', As an example, the study observed that some words from the paragraphs were 'done as per the need basis of the project and can be pre planned or be done throughout the project work process as we stay prepared for any unexpected situation ' illustrate about the scope of social inclusion and is therefore marked as codes.

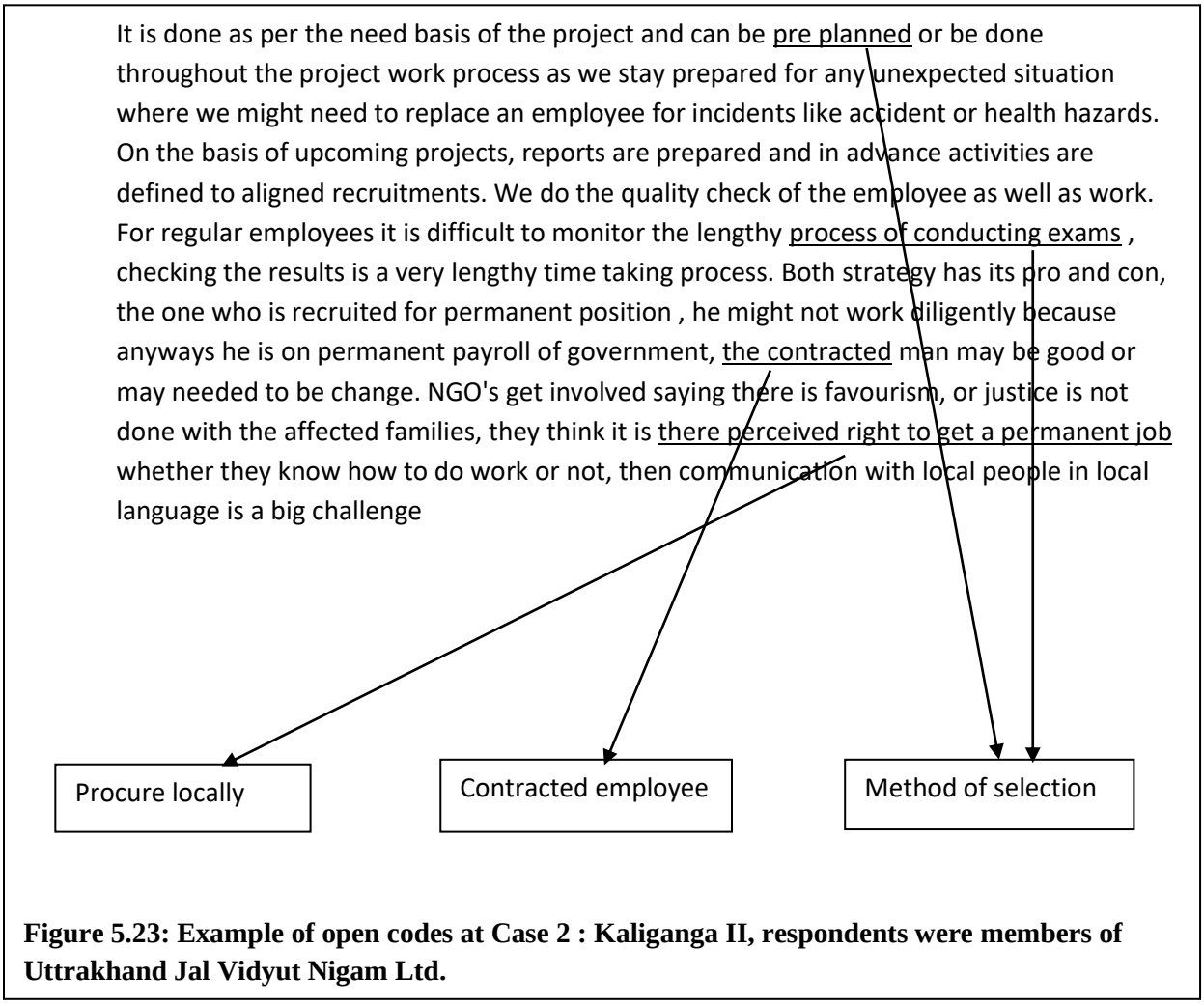


Figure 5.23: Example of open codes at Case 2 : Kaliganga II, respondents were members of Uttrakhand Jal Vidyut Nigam Ltd.

5.10.8 Open Coding Case 2- Kaliganga II – Respondents are members of Labor Union

Figure 5.24 as illustrated down below demonstrates ways by which the open codes were formed from within the statements made by respondents at interview time' 'counseling with local people',' more practical knowledge, 'preference' As an example, the study observed that some words from the paragraphs were phrases encourage them to take part in exam and be a part on merit basis' illustrate about the scope of social inclusion and is therefore marked as codes.

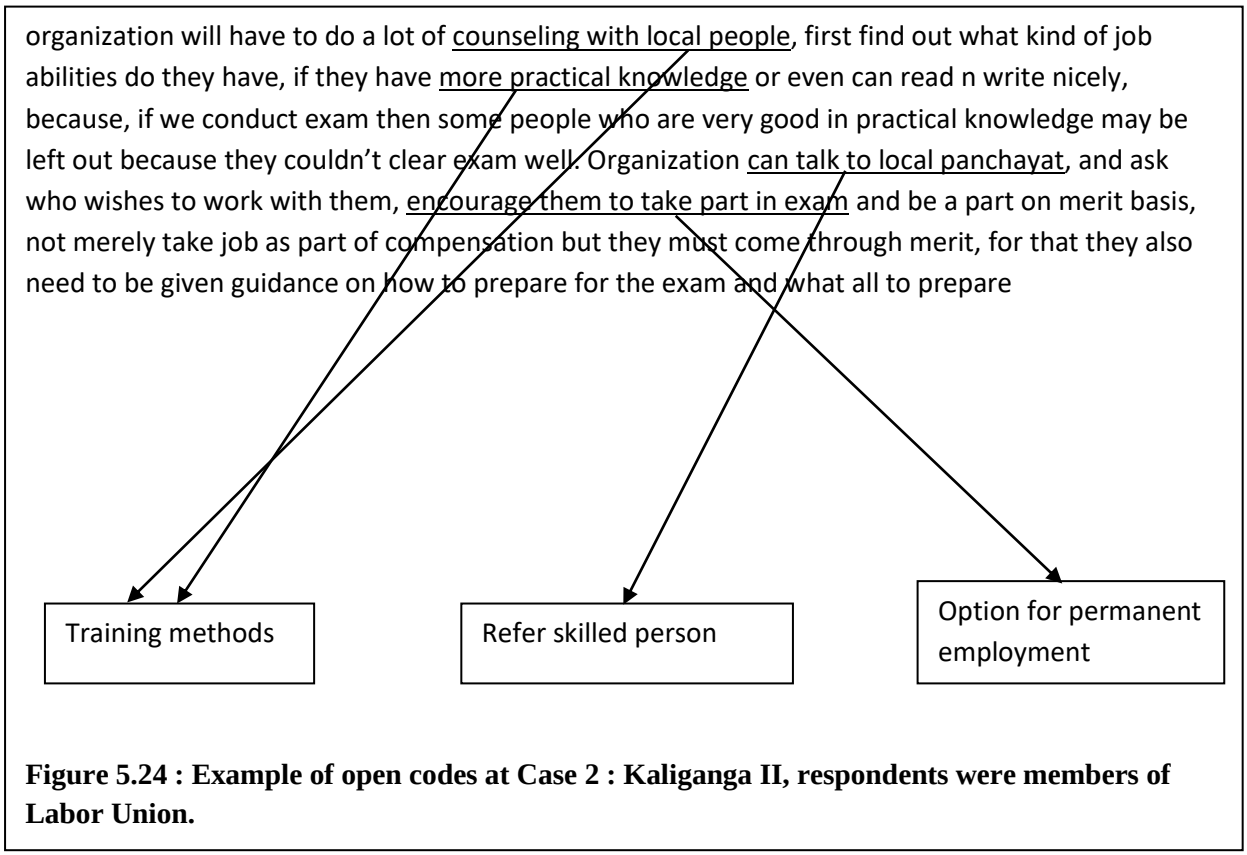


Figure 5.24 : Example of open codes at Case 2 : Kaliganga II, respondents were members of Labor Union.

The scripts derived via interview method were coded with help of qualitative analysis software called Atlas ti 7.0. With help of this software data analyzing process was enabled, further linking of the codes creating memos, searching, editing, and reorganizing, and for visual display of data and findings (Miles & Huberman, 1994; Weitzman, 2000 ; Creswell, 2007).

5.11 Step II – Axial Coding

Once the study conducted its first step of coding for Case 1 & Case 2; next researcher has conducted second step of coding, i.e., Axial coding for Case 1 & Case 2. The codes that have similar aspects were combined for creating categories that are conceptual in nature and abstract within the empirical data in axial code process. This sort of collaboration would help in creation the major theme that would arise from the empirical data(Strauss & Corbin, 1990). Codes are clubbed in category with help of a funnel up approach as illustrated in figure 5.25 below:

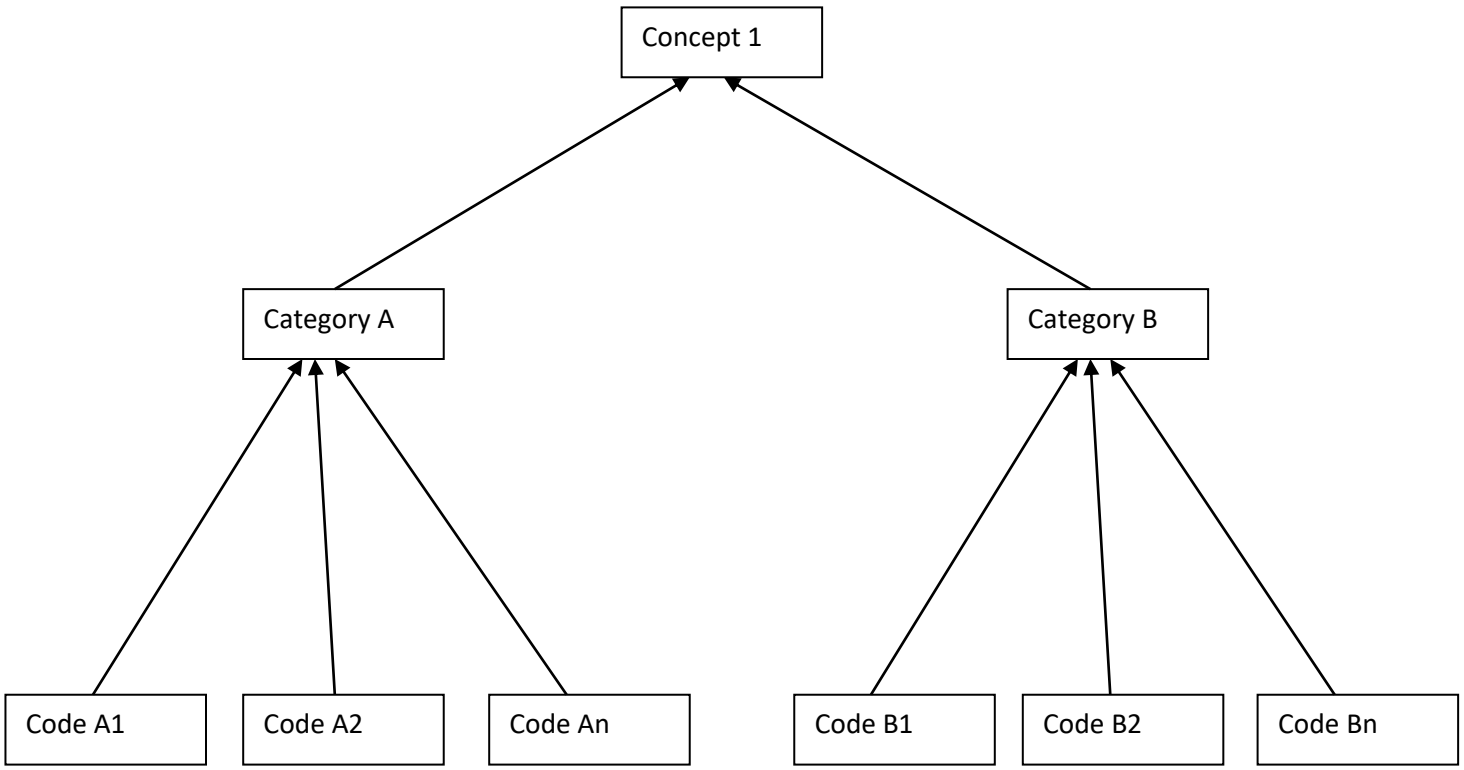


Figure 5.25 : Concept, Category and Code

During the open coding (i) the measures of social inclusion during the construction phase of the small hydro power plant in Uttrakhand (ii) measures of social inclusion and aspects of strategy to execute the measures (iii))the relationship between measures of social inclusion and the factors of aspects of strategy to execute the measures of social inclusion designated with marking so that they can be easily reterived (Miles & Huberman, 1994) with help of ope coding methods (Strauss & Corbin, 1990). Further codes are centralized into wider divisions. The these divisions are restricted into concepts/ themes. Since it comes from conceptualization of data, these are the basic units of analysis in grounded theory.

5.11.1 Axial Coding : Respondents are Contractors

Initial conceptual constructs identified related to measures and scope of social inclusion which was derived from the Literature worked as base for identification of concepts. Assurance depicting the conceptual constructs which were initially derived was firstly coded. Then these codes were developed. Then the developed codes were categorized and categories; each category represented the factors which are related to scope and measure of social inclusion during custruction phase of small hydro power plant in Uttrakhand. Finally, each category is linked to the category of initial conceptual constructs. In a category which could not be associated with the initial conceptual constructs is identified as a new category (a new concept emerged).

Figure 5.26 shows this categorization and linking process in detail. (See Appendix10)

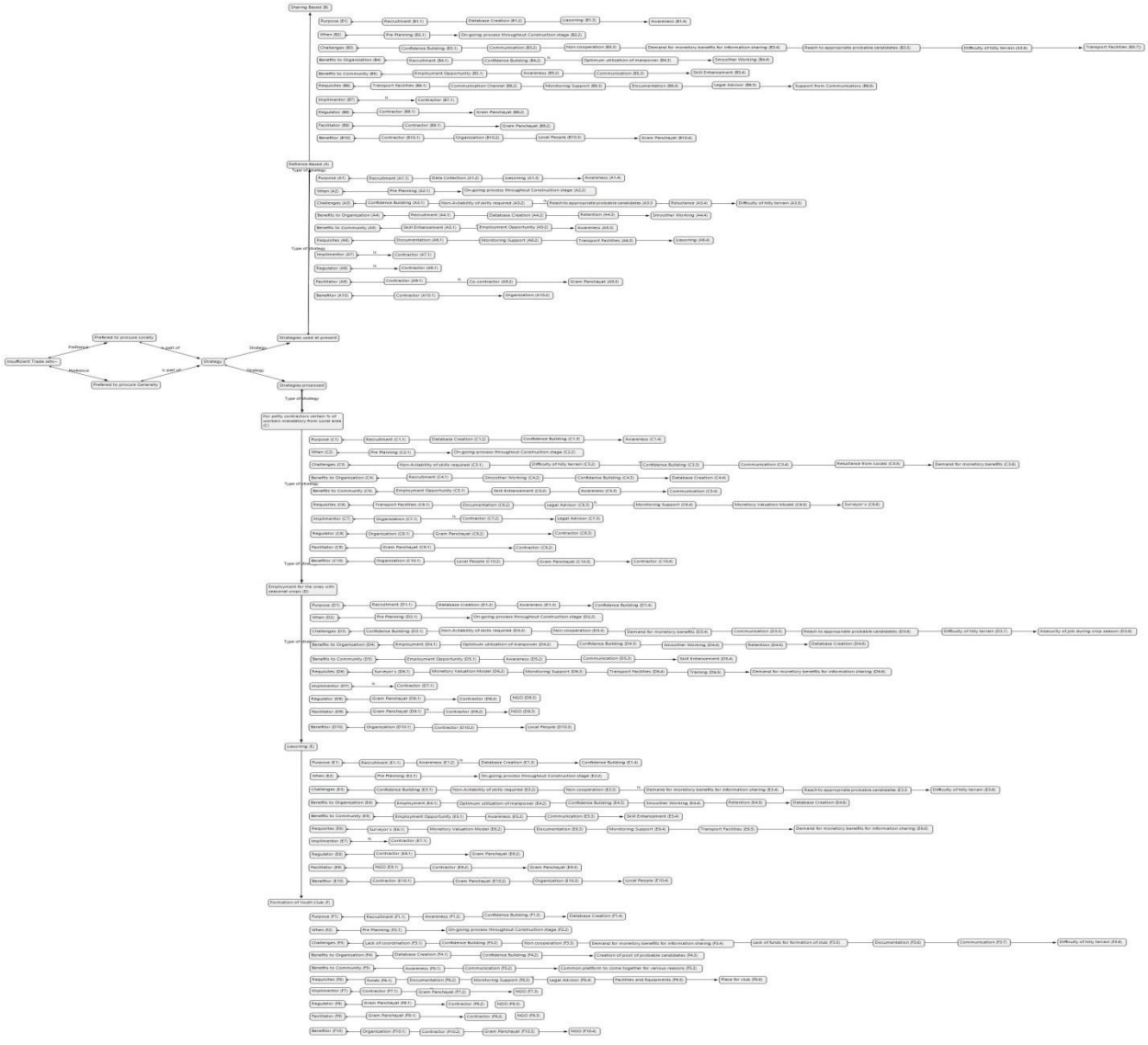


Figure 5.26: Axial Coding : Respondents are Contractors

5.11.2 Axial Coding : Respondents are Gram Panchayat

Initial conceptual constructs identified related to measures and scope of social inclusion from Literature served as basis of identifying concepts. Statements illustrating these initial conceptual constructs are coded first. Then these codes are consolidated into categories; each category represented the factors which are related to scope and measure of social inclusion during custruction phase of small hydro power plant in Uttrakhand. Finally, each category is linked to the category of initial conceptual constructs. In a category which could not be associated with the initial conceptual constructs is identified as a new category (a new concept emerged).

Figure 5.27 shows this categorization and linking process in detail. (See Appendix11)

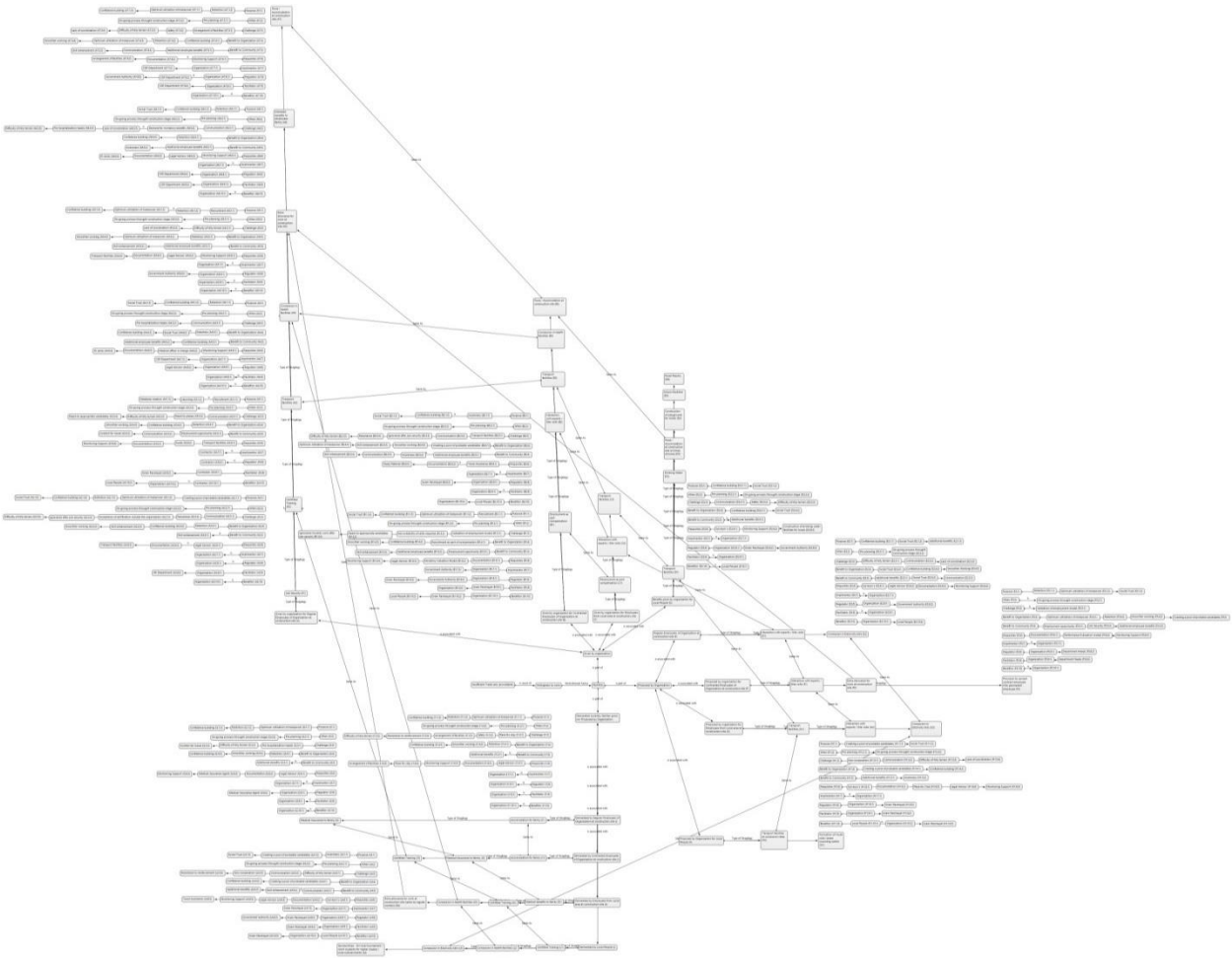


Figure 5.27 Axial Coding : Respondents are Gram Panchayat

5.11.3 Axial Coding : Respondents are Members at UJVNL

In case of respondents who were members of UJVNL; Initial conceptual constructs identified related to measures and scope of social inclusion which were observed from the review of literature. Illustration of the constructs derived were firstly coded. Then these codes were categorized and each category represented the factors which are related to scope and measure of social inclusion during custruction phase of small hydro power plant in Uttrakhand. Finally, each category is linked to the category of initial conceptual constructs. In a category which could not be associated with the initial conceptual constructs is identified as a new category (a new concept emerged).

Figure 5.28 shows this categorization and linking process in detail. (See Appendix 12)

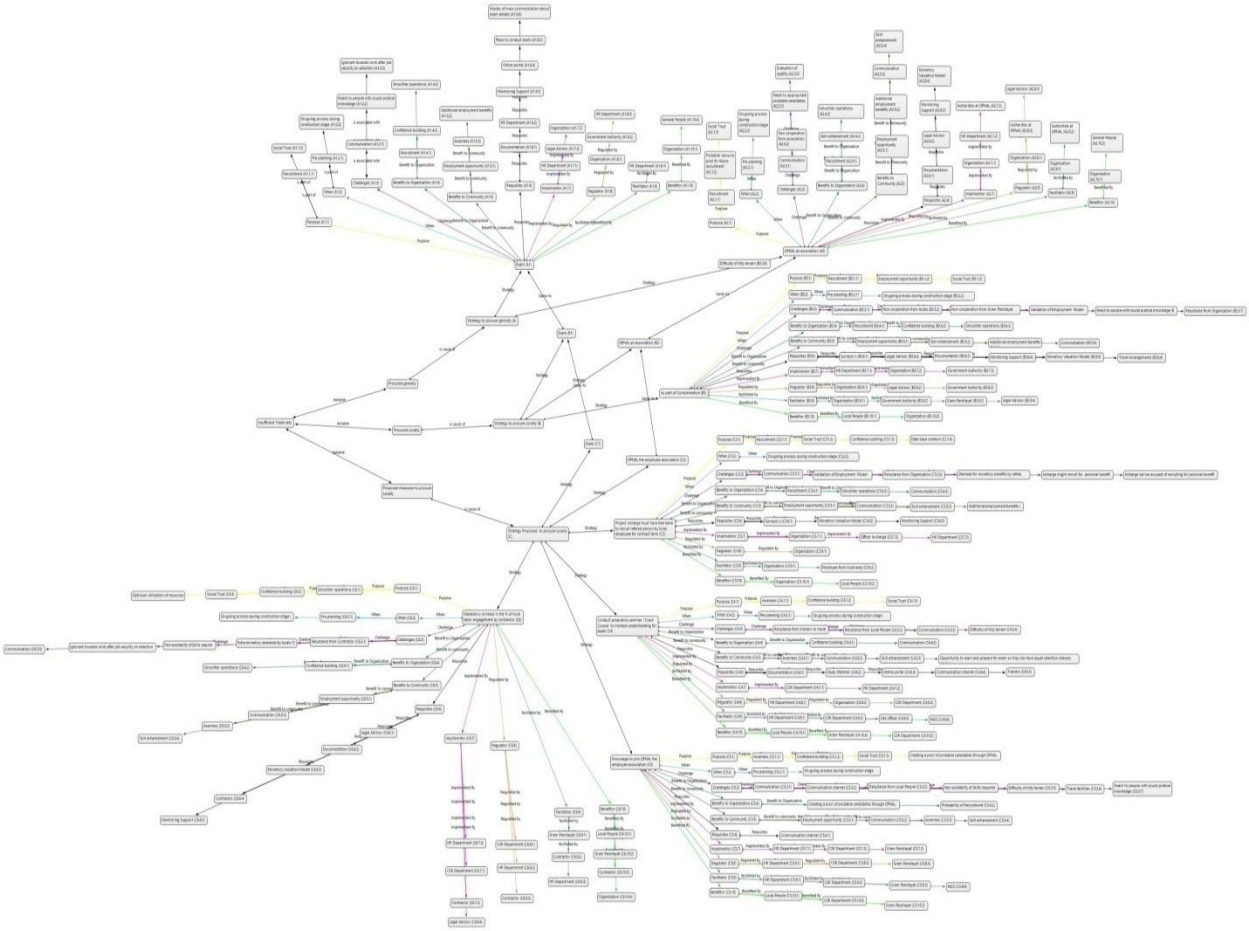


Figure 5.28: Axial Coding : Respondents are Members at UJVNL

5.11.4 Axial Coding : Respondents are Members of Labor Union

In case of respondents who were members of labor union; Initial conceptual constructs identified related to measures and scope of social inclusion which were observed from the review of literature. Illustrations of the constructs derived were firstly coded. Then these codes were categorized and each category represented the factors which are related to scope and measure of social inclusion during construction phase of small hydro power plant in Uttrakhand. Finally, each category is linked to the category of initial conceptual constructs. In a category which could not be associated with the initial conceptual constructs is identified as a new category (a new concept emerged).

Figure 5.29 shows this categorization and linking process in detail. (See Appendix 13)

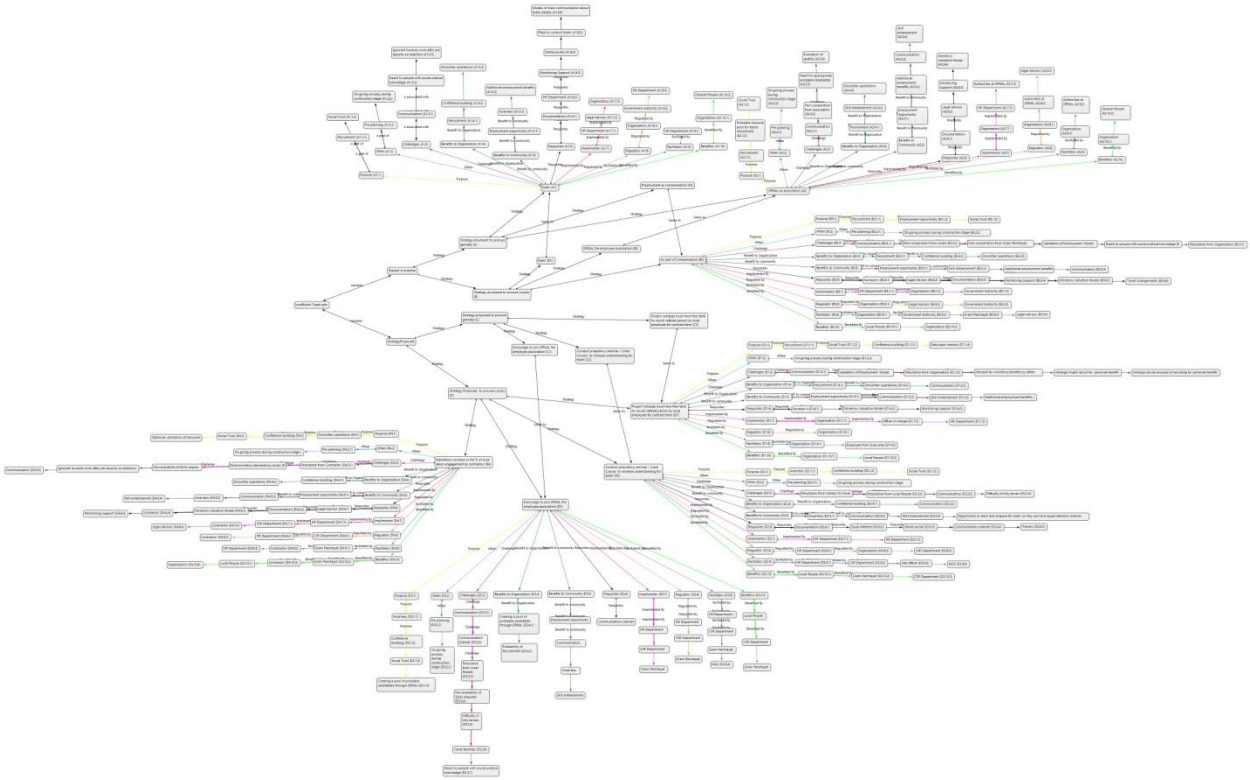


Figure 5.29:Axial Coding : Respondents are Members of Labor Union

Labeling all the data derived via interview method was coded, divisions and approach were carried with help of technique called open code, Axial code which are illustrated above. The union among the code and divisions are configuration on them. The relationship are generally of ‘ is part of’; ‘associated with’. The relation among the code, category and concept were observed with help of these casual relations. Then, the relation is described as the composition of a particular concept or category.

Similarly; Axial coding was attempted for Case 2

5.11.5 Axial Coding : Case 2: Kaliganga II : Respondents are Contractors

In case of respondents who were contractors; Initial conceptual constructs identified related to measures and scope of social inclusion which were observed from the review of literature. Illustrations of the constructs derived were firstly coded. Then these codes were categorized and each category represented the factors which are related to scope and measure of social inclusion during construction phase of small hydro power plant in Uttrakhand. Finally, each category is linked to the category of initial conceptual constructs. In a category which could not be associated with the initial conceptual constructs is identified as a new category (a new concept emerged).

Figure 5.30 shows this categorization and linking process in detail.

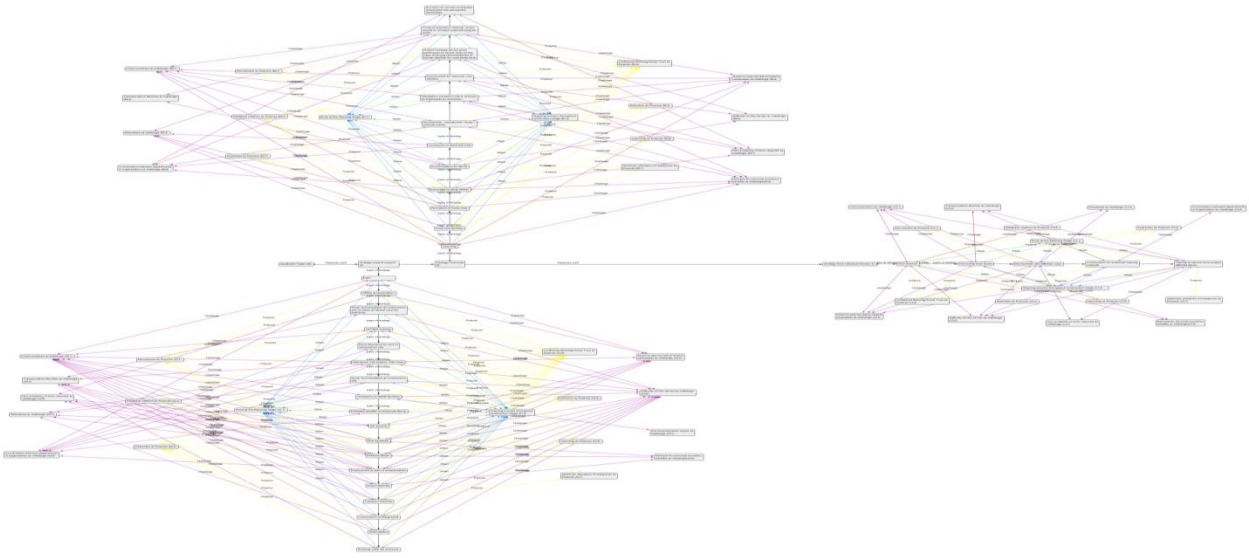


Figure 5.30: Axial Coding : Case 2: Kaliganga II : Respondents are Contractors

5.11.6 Axial Coding : Case 2: Kaliganga II: Respondents are Gram Panchayat

In case of respondents who were members of gram Panchayat; Initial conceptual constructs identified related to measures and scope of social inclusion which were observed from the review of literature. Illustrations of the constructs derived were firstly coded. Then these codes were categorized and each category represented the factors which are related to scope and measure of social inclusion during construction phase of small hydro power plant in Uttrakhand. Finally, each category is linked to the category of initial conceptual constructs. In a category which could not be associated with the initial conceptual constructs is identified as a new category (a new concept emerged). *Figure 5.31 shows this categorization and linking process in detail.*

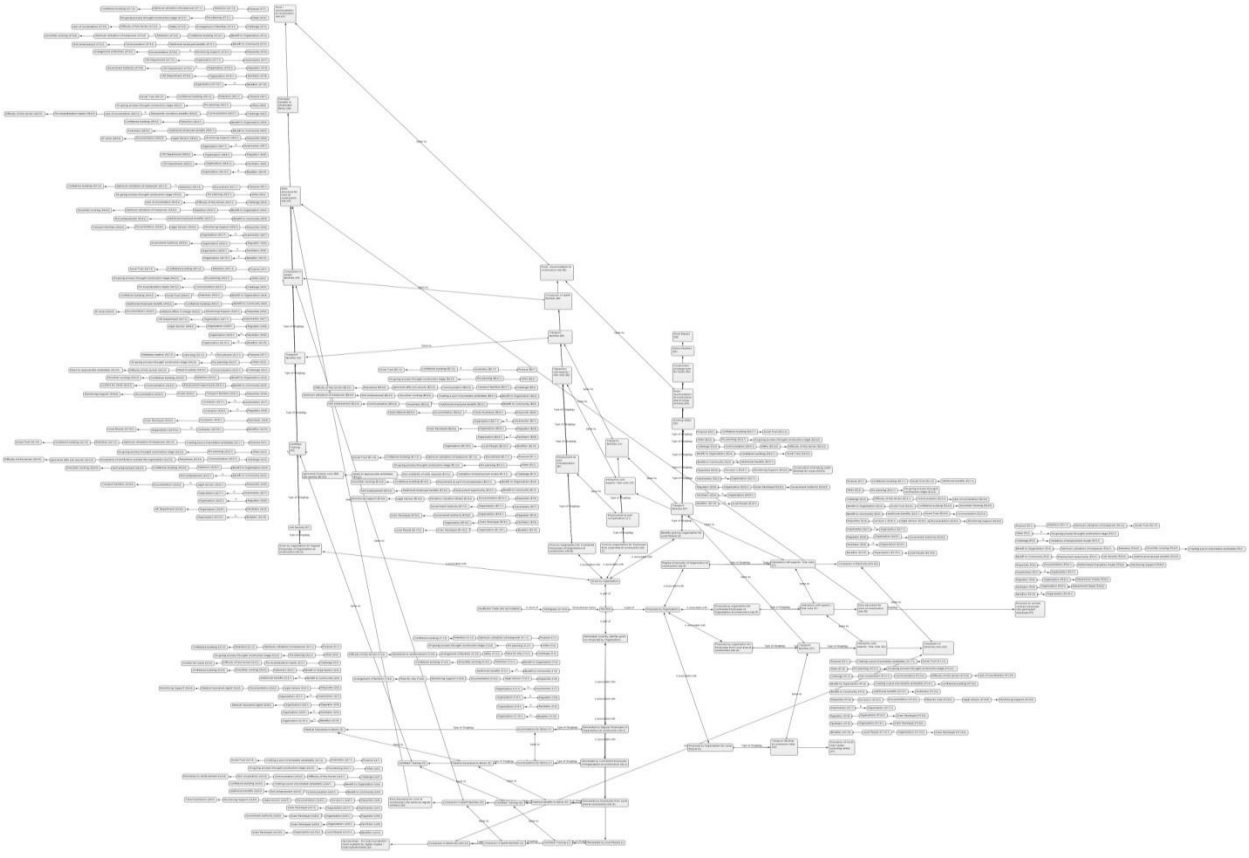


Figure 5.31: Axial Coding : Case 2: Kaliganga II: Respondents are Gram Panchayat

5.11.7 Axial Coding : Case 2: Kaliganga II : Respondents are Members at UJVNL

In case of respondents who were members of UJVNL; Initial conceptual constructs identified related to measures and scope of social inclusion which were observed from the review of literature. Illustrations of the constructs derived were firstly coded. Then these codes were categorized and each category represented the factors which are related to scope and measure of social inclusion during construction phase of small hydro power plant in Uttrakhand. Finally, each category is linked to the category of initial conceptual constructs. In a category which could not be associated with the initial conceptual constructs is identified as a new category (a new concept emerged).

Figure5.32 shows this categorization and linking process in detail.

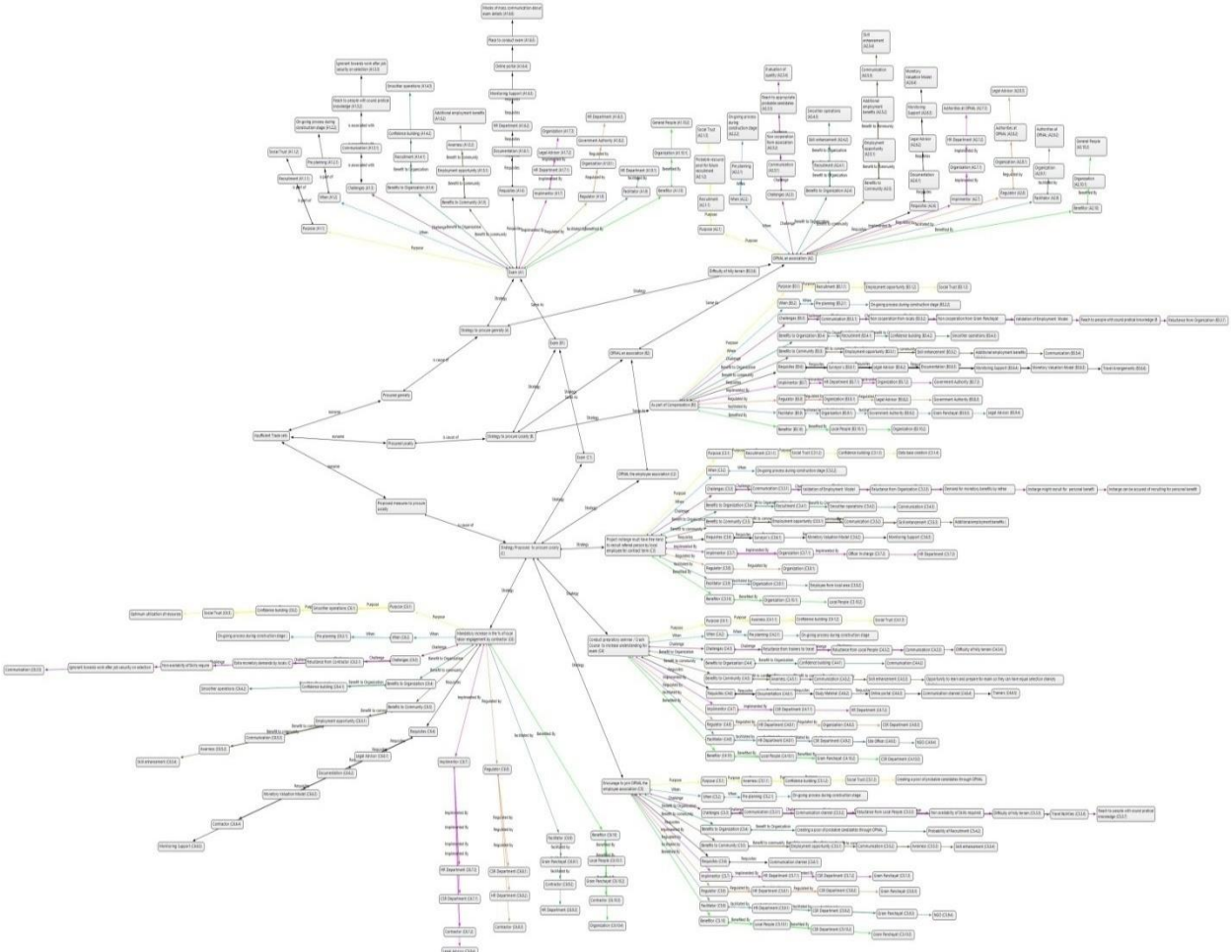


Figure 5.32: Axial Coding : Case 2: Kaliganga II : Respondents are Members at UJVNL

5.11.8 Axial Coding : Case 2: Kaliganga II : Respondents are Members of Labor Union

In case of respondents who were members of labor union; Initial conceptual constructs identified related to measures and scope of social inclusion which were observed from the review of literature. Illustrations of the constructs derived were firstly coded. Then these codes were categorized and each category represented the factors which are related to scope and measure of social inclusion during construction phase of small hydro power plant in Uttrakhand. Finally, each category is linked to the category of initial conceptual constructs. In a category which could not be associated with the initial conceptual constructs is identified as a new category (a new concept emerged).

Figure 5.33 shows this categorization and linking process in detail.

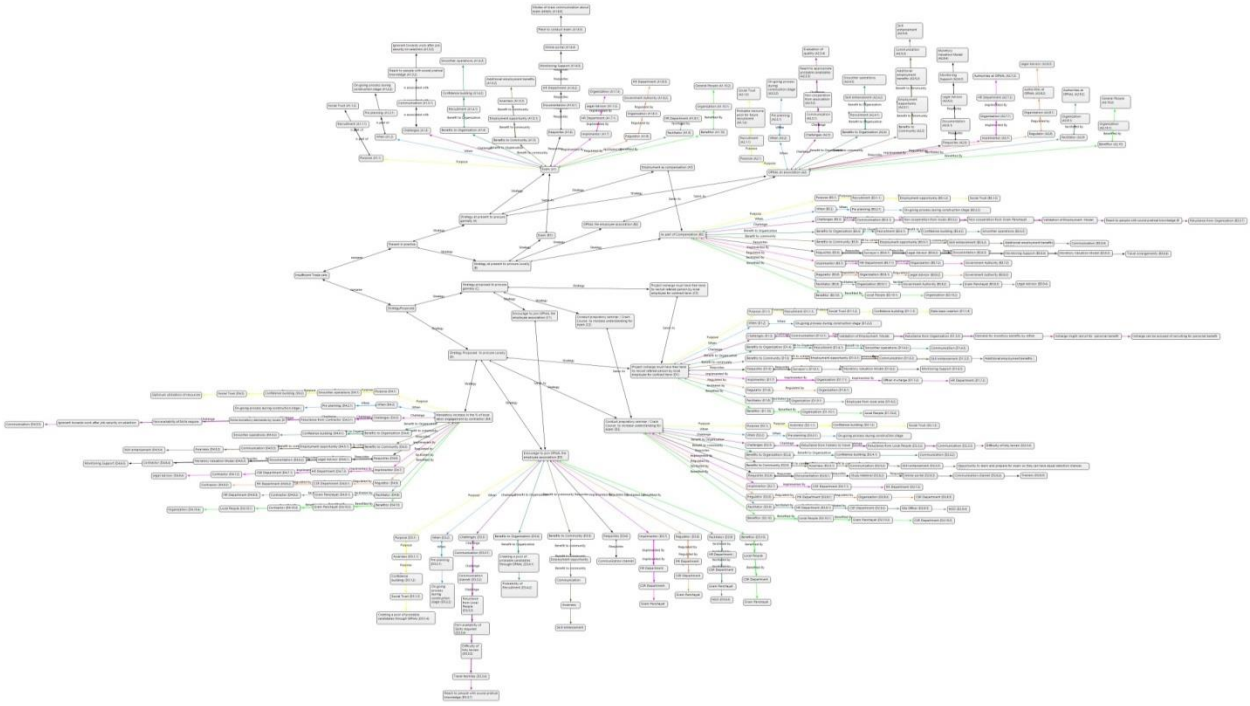


Figure 5.33: Axial Coding : Case 2: Kaliganga II : Respondents are Members of Labor Union

Labeling all the data derived via interview method was coded, divisions and approach were carried with help of technique called open code, Axial code which are illustrated above. The union among the code and divisions are configuration on them. The relationship are generally of ‘ is part of’; ‘associated with’. The relation among the code, category and concept were observed with help of these casual relations. Then, the relation is described as the composition of a particular concept or category.

After Completing Open Coding and Axial Coding for Case 1 & Case 2, Selective coding was performed for Case 1 & Case 2.

5.12 STEP III: SELECTIVE CODING

Accomplishments mentioned by interviewees leading to the measures of social inclusion to reduce the problem of skill gap during construction stage in small hydro power plant of uttrakhand are identified by creating appropriate codes in Atlas ti 7.0 software. Figure 5.34 below presents how casual relationships identified from the interpretation of interview statements For Case 1 : Madhmaheshwar (For detail, see Appendix 14)

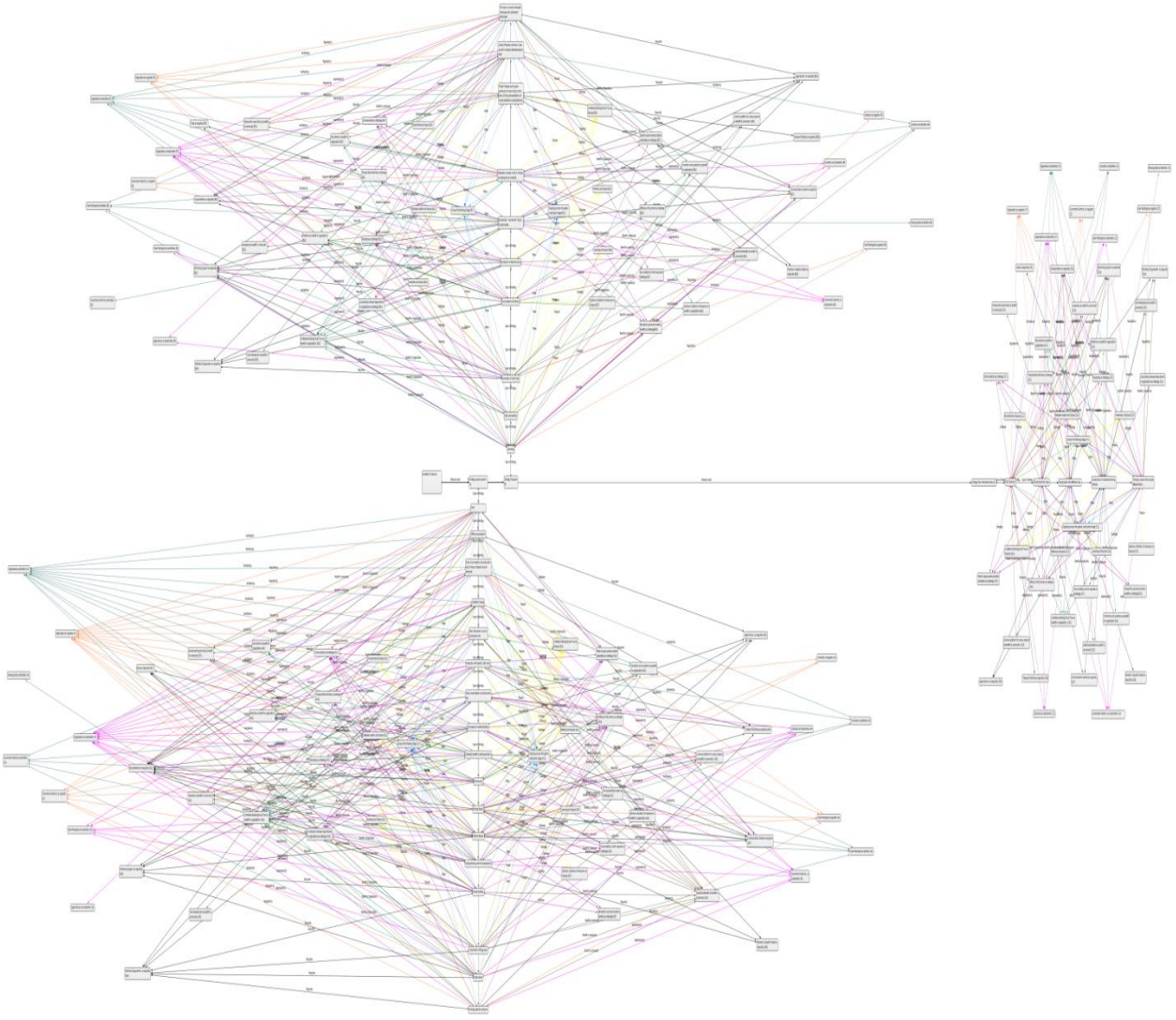


Figure 5.34: Selective Coding

5.13 STEP III: SELECTIVE CODING – CASE 2: KALIGANGA II

This step supports Accomplishments mentioned by interviewees leading to the measures of social inclusion to reduce the problem of skill gap during construction stage in small hydro power plant of uttrakhand are identified by creating appropriate codes in Atlas ti 7.0 software.

Figure 5.35 below presents how casual relationships identified from the interpretation of interview statements For Case 2 : **Kaliganga II**

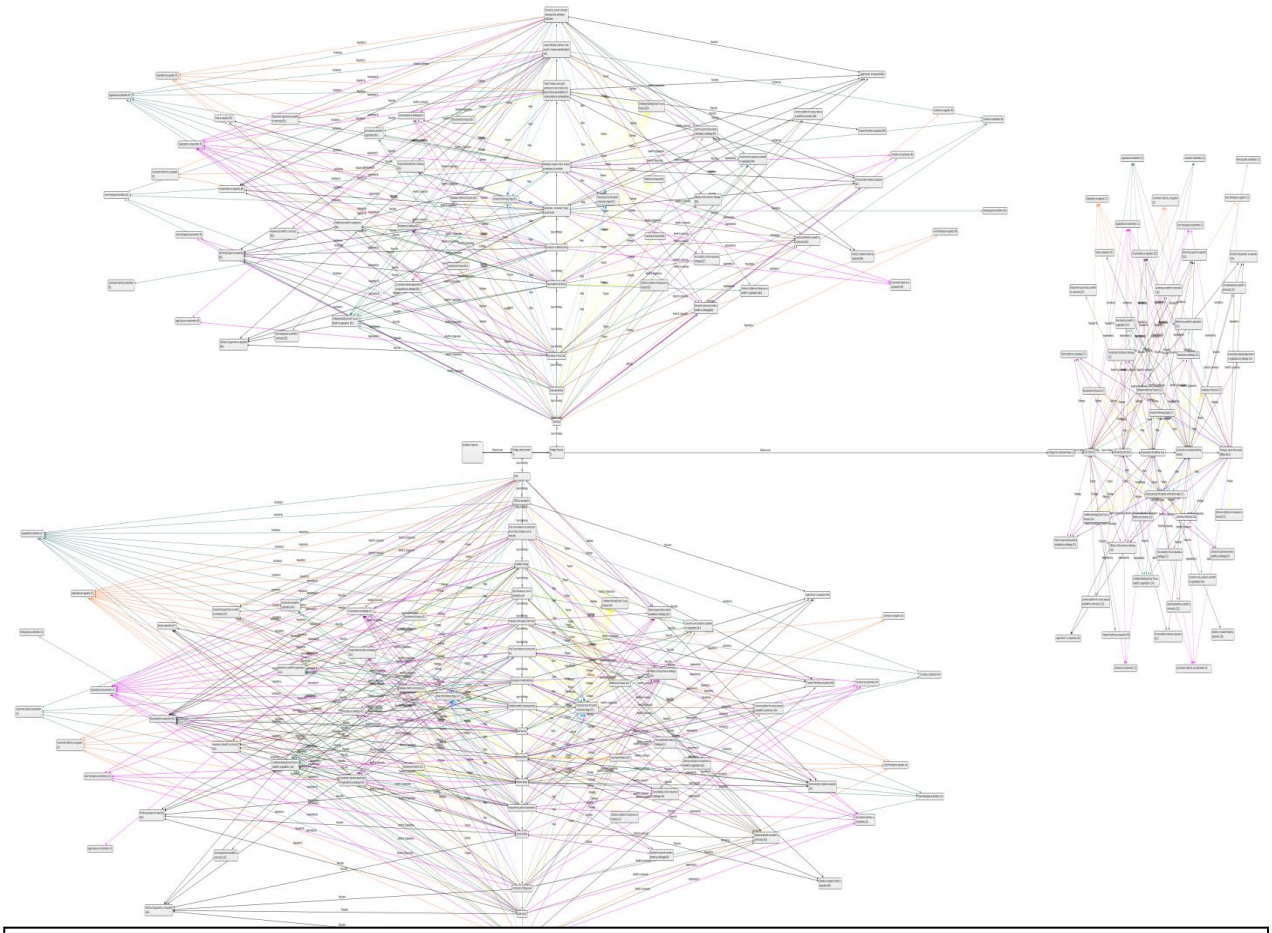


Figure 5.35: Selective Coding – Case 2: Kaliganga II

Above we can see that *firstly* open coding, *secondly* Axial Coding and *finally* Selective Coding were performed for Case 1 & Case 2 respectively.

5.14 WITHIN CASE ANALYSIS: CASE 1 – MADHYAMAHESWAR

Within Case Analysis in Case 1 – Madhmaheswarpresents in detail the case study conducted at plant site in Madmaheshwar (Rudraprayag), Uttrakhand. The detailed data analysis findings are reported in the subsequent manner on measures and scope of social inclusion to reduce the problem of skill gap in small hydro power sector of Uttrakhand. The findings and details are dicussed in four parts. These parts are divided on the basis of four respondent types (i) Respondents being the contractors (ii) Respondents being the members of Gram Panchayat (iii) Respondents being the members of UJVNL (iv)Respondents being the members of Labor Union.

5.14.1 Respondents being the contractors

Our aim was to find the measures and scope of social inclusion to reduce the problem of skill gap in small hydro power plant of Uttrakhand and ultimately address the problem of Inadequate availability of skilled manpower at the execution stage which is leading to Cost over run and Time over run in Small hydro sector in Uttarakhand. For generating our understanding the contractors were asked certain set of questions on the various measures considered by them to hire local talent. Also, according them what more can be done to address the business problem. F*irstly , the researcher inquired about According them, which trade set did they find is insufficient?*

"We work in association form, so if we need some particular people we ask for refrence from our co-contractors, We are main contractors, and give petty contracts to small contractors from the site area, they arrange for workers which are often not skilled but lower level labourers is found in abundance, but the once that require attention are the skilled workforce such as operators, mechanics, electricians, lineman skilled specifically in hilly terain, concrete workers etc. There is

problem in getting many trade sets because we procure them from different places, the problem is not insufficieny, problem is finding them with the required skill sets"

Among these trade set which trade sets would you like to procure locally at construction site?

"Prefrence is given to the one who are skilled at local work site, as these have lesser demands in terms of work and stay arrangements, hence prove to be cheaper. But often we see that conctrete workers, electricians are difficult to find in remote hilly location sites. Often we see that these local people wish to be petty contractors themselves instead of filling the gap of skilled labourers. People who can do construction work can be procured as they know who to construction in hilly areas, they can be hired for electrical works, or even for masony works"

What are the different strategies do you use to hire the required trade sets at the location site?

"A chain/ association is seen in among the contractors, the main contractor has sub contractors and petty contractors under him, they work mostly on refrence basis. 1. the local government body is informed about the vacancy and given prifrence if they have skilled workers to fill these positions. 2. The contractor sources skilled labourers from labour makets. 3. Sharing of Labours among the contractors is often seen as a common phenomina 4. The labour working with the contractor often refers a known employee who is tested and given employement."

What is the purpose of using this strategy?

"Recruitment; creating pool of inquisitive workforce, easily available data set of youth and their abilities as well as a close contact is maintaied among us, so we know how many people are working on which project, we don't have wesite or conduct exam to hire masons or electricians, its easy to ask for refrences and see if he knows how to do work then he is on payroll, our job is to get work done in the best way for that ensuring we have people to work for us"

During what stage is the strategy planned and implimented?

"Pre planning is done when the contract is awarded + during the project as per the need arisies the contractor procures locally by contacting the local Gram Panchayat or refrence made by some existing employee of some other petty contractor working along on the project. mostly done before hand, but also done during the construction stage, construction stage is a time taking process, it takes years and cannot imply that the same worker will.."

Who is the driving force behind each strategy ?

"we take recommendation from gram panchayat or local authority also, and organisation also; Implimentor - Contractor ; Facilitator -Contractor, Gram Panchayat, Fellow petty contractor; Benefitor - Contractor, Organisation ; regulator - Contractor, Because we have to get the work completed on time, then only we will get our payment from the organization"

Challenges faced by each strategy?

"The workers who express desire to work may or may not be skilled. Local political pressure for recruiting local people even their skills don't match. Pressure from Organisation for quality workforce. Added demands by migrated workers is additional cost to the contractors. Managing labor is not easy, they have many problems, wages being the biggest one. labor are many, different people with different mind sets, some work only for money, some want more than money , these are the ones who have been working for quite"

Requisites required for each strategy.

"Good liasons with fellow contractors/ Gram Panchayat /training for local workers. maintain good relations with our fellow contractors and co-workers maitain their records, keep in touch to know where they are working, what kind of job they are doing, by when their work will complete"

What are the benefits that the organisation is seeking from the implimented strategy?

"recruitment/ work done on time effectively and efficiently, organisation wants their work, we have to see our part of the work must be completed so that they relize our payment organisation wants quality work, for that they keep a regular check, it is upto us to maintain our workforce, afterall it is matter of respect for us, and based on our work reportorganisation wants quality work, for that they keep a regular check, it is upto us to maintain our workforce, afterall it is matter of respect for us, and based on our work report"

5.14.2 Respondents being the Members of Gram Panchayat

Our aim is to find the measures and scope of social inclusion to reduce the problem of skill gap in small hydro power plant of Uttrakhand and ultimately address the problem of Inadequate availability of skilled manpower at the execution stage which is leading to Cost over run and Time over run in Small hydro sector in Uttarakhand. For generating our understanding members of Gram Panchayat were asked certain set of questions to understand their views on the various measures considered by them, that the organization should consider to hire local talent. Also, according them what more can be done to address the business problem.

How much according to you is the willingness of the local people to work for the organization

"when they are setting up power plant, the entire village is affected in some or the either way , local people want to work, they are willing, the organisation and the setting up of power plant has affetcted their livelyhood, so the organisation must provide other means. Most of the people wish to work at the organization"

What are the motivating factors for the local people to work for the organization? "The people will get a stedy income, they will get a steady work life balance, it will boost a sense of pride in locals as they will be working for a good big organisation,the organisation has had an impact on the enitre area where they are setting up the plant, some people are relocated, It is not just money, all the other facilities that the government is giving, those facilities will be extended to the local people, also more avenues will open for women anf children in local area."

What more facilities should be given by the organisation for people in the local area to attract more workforce?

"For the Skilled workorce working within the area (can be with another organisation) our organisation can organise free of cost certificate program for skill enhancement at the site location, once in six months or once in year 2. As part of compensation the organisation wishes to offer job position to a dependent of the affected family persons. But the same may or may not be skilled to execute the job expected, so training must be given to such people as they are probable skilled workforce for the organisation otherwise the organisation obligies the locals by saying despite of you not capable of doing work we are still hiring you. 3. The HR Department can tie-up with the vocational institutes persent in the local area, and information can be imparted to enhance the skills in the students which are required by the organisation all the facilities that it is extending to its employees, should be given to local people, organisation

coducts traning programs for its employees, so they can also let few locals also join in the training program, it will help in building skills among local people"

The facilities/ benefits calimed by the organisation are they being recived by the local community

"since it is a government organisation the facilities/ benefits calimed by the organisation are being given to locals but againg being a typical government organisation, facilities / benefits are being meet, but quality is a big issue, its is typical government organisation, and we all know, in government works timelines are never meet, , in general local peoplewho are not working have to fight for getting some facilities, we cannot ignore that"

What benfits must be given for the local community?

"what ever facilities they are giving to their on site workers they can allow locals to use them, for example they make dispensary for their on site workers, so locals can also be allowed to use it in emergency. They consruct house and boarding facilities for their employees so they can also help locals in building thier homes too, and not just only give job to affected ones, help in providing some opportunity or other livelyhood ways. women can be given training in knitting for example. hydro power plant is set in remote locations, we all know that, which itself tells you that we are living in remote locations, hence the facilities are less here, because of e are living in remote locations, hence the facilities are less here, because of transportation and accesability problems people living here face difficulties in daily life. the organisation is coming to our town, and disturbing our daily lives, they take our site areas, some times playground, or school, or some peoples houses, even shops."

What benefits must be given to employees working with organisation from the local community?

“free of cost certificate and opportunity to enhance skill; learning new skills and steady income through job; The students think that they are already being prepared by the institute might not want to recive training from an organisation only specific to them and what ever facilities they are giving to the employees local employees also get same and must get priority at time of training.what ever facilities they are giving to the employees local employees also get same, because now they are employees of the organisation, in times of promotion or training local must be given priority, in times of promotion or training local must be given priority.”

By giving all these benfits to the organisation benefit in return

“easy access to avilable skilled workers and gathering database to probale workforce of the organisation; generating acceptance towards the project and sourcing manpower; creating a pool of skilled workforce; Easily avilable data about the skills of workforce present in the area and their abilities so further planning can be done by HR on how to pool them to our organisation and how much workforce is to be planned also which skill set must they focus on building or sourcing, the local will not run from the project in between, they will not take long leave to visit home and family, because he and his family belong to that area, so work will not get stagnated, easy available and loyal , long term working employees is what the organisation is getting.”

5.14.3 Respondents being the Members of Uttrakhand Jal Vidyut Nigam Ltd. (UJVNL)

Our aim is to find the measures and scope of social inclusion to reduce the problem of skill gap in small hydro power plant of Uttrakhand and ultimately address the problem of Inadequate availability of skilled manpower at the execution stage which is leading to Cost over run and Time over run in Small hydro sector in Uttarakhand. For generating our understanding members of UJVNL were asked certain set of questions to understand their views on the various measures

considered by them to hire local talent. Also, according them what more on plant site can be done to address the business problem.

According to you, which trade set do you find is insufficient?

"Often technical trades sets are noticed to be insuffcient, tarde sets like Welding Skills, surveyor's , Electrician, Sheet Metal Worker, Crane Mechanic ,operators etc. Having a good no. of employees is just no problem at all, but wheather they are skilled or not is what is important. civil works incharge our job is not to recruite or hire, we have to create jobs and given to the locals because of political pressure but they don't know how to perform job"

Among these trade set which trade sets would you like to procure locally at construction site?

"For procuring locally, skills required have to be matched with the skills present amont the local population and the hiring is done by the HR department for regular permanent employees. The trade sets which do not require much technical training can be looked into hiring at the local level, such as, Masonry, Storekeeper, Plumbing skills, Painting skills , etc. Most of the Hydro projects are based in Himalayan region, here seasonal crops are grown, the off season farmers look for alternative source of income, in such circumstances farmers can be offered temporary jobs with the organisation; but mostly they can be hired for labour position and it is good if our workers and staff are from local area, then they work more happiliy and also ask for less leaves."

What are the different strategies do you use to hire the required trade sets at the location site?

"For Hiring staff there are mainly three methods :1. For regular staff, advertisment is taken out in the newspaper and written examination is conducted, the ones who qualify then they are offered regular position at the organisation. After recruiting them they are given the position of

apprentice and given training for 1 year. 2. Recruited by organisation but on contractual basis, for this the organisation has tie-up's with an association called OPNAL, this association has registration of the retired army personals and passouts of ITI, If there is requirement by the organisation for a particular position the same is intimated to the organising commitiee at OPNAL and they send an employee which matched the skill sets required. 3. By Contractor - The contractor hires his team members according to his requirments, in this process the organisation does not play any role, the organisation just checks the quality of the employees hired by the contractor , the contractor may or may not hire locally depending upon his satisfaction level of rquired skill sets that match.Also recruitment can be done as compensation to thoese with affected crops ,Crops can be affected in two ways, 1. that is permanently damage to the land and crop, so no crop can be grown later. In this case option of giving permanent job with the organisation can be considered. 2. Temporary damage to the crop, that is a particular season's crop is damaged or a for a particular time the crop can not be grown, but has future possibility for growing. In this case temporary job can be offered till the land can bear crop again."

What is the purpose of using this strategy?

"For government norms, recruitment, either for regular positions or contracted, transparency in hiring process, No one can accuse of being cheated or favoured"

During what stage is the strategy planned and implimented?

"In case of regular positions, the organisation must plan in advance because the written examination is conducted and hiring done on the basis of merit. But for Contracted employees that are through OPNAL, the organisation hires as per the requirements, that can be anytime during the year. We also will discuss energy issues in remote rural areas with panchayat and

explain them the importance of having a neighbourhood renewable energy source and its importance for the remote village site. This can be done my the organisation's surveyor's and CSR officers by visiting the remote location and arranging a discussion with the locals, both pre-planning stage , and on going through project also. recruitment process and when proper estimate work sheets are made"

Who is the driving force behind each strategy?

"The project/ Department incharges feel the need of an added employee, they inform the HR Department, the HR Department is the implimentor, the organisation is the benefitor, the HR Department and the OPNAL are facilitators and HR department is the regulator"

Challenges faced by each strategy

"For regular employees its is difficult to monitor the leangthy process of conducting exams , checking the results. 2. A close contact must be kept with the OPNAL association and a quality check needs to be done on the employee and their skills sets. 3. Involvement of NGO/ Social groups not understanding the practicality of projects and its importance for a larger role, but instead creating sympathy with locals and delaying the project work 4. communication in local language 5. validation of model that valuates employment in terms of money because they consider they are being paid less as they have beared losses due to being affected from the project, and money given to them as wages is not sufficient to cover these losses. 6. reluctance from HR department and legal advisors to travel to remote locations 7. Involvement of NGO/ Social groups not understanding the practicality of projects and its importance for a larger role, but instead creating sympathy with locals and delaying the project work 8. reluctance from local to learn required skill they think that as part of compensation it is thier percived right to get job and wages irrespective of thier abilities to perform the job duties therefore, making it all the

more difficult to train them. 9. Reluctance from industry expert to visit far/rural placesto talk to locals”

Requisites required for each strategy

“Conducting exams/ Agreement with OPNAL by HR department and need to check stationary and other resources along with exam schedule. Organisation gets exam conducted for reqruiting permanent positions, and hire through OPNAL for contractual positions. For exam HR will tell you, they give add in newspaper or wesite, and after deciding date they conduct exam, for that what they need is papers, stationary, place to do exam etc; for OPNAL contract is already signed, we give requirment details to HR, and HR communicates the same to OPNAL, when OPNAL sends us the person, we do quality check of the person by giving him some task and check his abilities by seeing how well he is doing that task.We give details to the HR department about how many people we require and what are the skill sets we are serching for, then the HR department will look into the matter.”

What are the benefits that the organisation is seeking from the implimented strategy?

“Recruitment, either for regular positions or contracted; Sourcing skilled manpower in local area/ support from local people, earning confidence of locals ; Sourcing of manpower without any recruitment cost as it is part of compensation budget; Developing awarness towards the various benfits of project and creating intrest in collectively working towards establishing an energy eficient system, government way of recruting person, clear and simple process, after we check their basic abilities then we send them for training for one year with ITI.”

What are the benfits that the organisation is offering to the community for the implimented strategy

"Fair Employment opportunity; employment and regular source of earing along with various other employee benfits extended to their family; Developing awarness towards the various benfits of project through advertisements and creating intrest in collectively working towards establishing an energy eficient system"

5.14.4 Respondents being the Members of Labor Union

Our aim is to find the measures and scope of social inclusion to reduce the problem of skill gap in small hydro power plant of Uttrakhand and ultimately address the problem of Inadequate availability of skilled manpower at the execution stage which is leading to Cost over run and Time over run in Small hydro sector in Uttarakhand. For generating our understanding members of Labor Union were asked certain set of questions to understand their views on the various measures considered by them, that the organization should consider in future to hire local talent. Also, according them what more can be done to address the business problem.

According to you, which trade set do you find is insufficient at the construction site of the small hydro power project

"There is insufficiency in a lot of trade sets often noticed at the construction site of projects because of which the existing workers feel prresure of work. Most significant skills gaps are seen in trades like Welding skills, surveyors, Electrician, Lineman, Wireman, crane mechanics, operators, sheet metal workers etc. the power house electrician , lineman etc are often seen to be short, because the burden comes upon the us, where as no aditinal pay is given and we have to do the overtime over all there is shortage in all the departments and shortage in many skill sets"

What is the organisation doing at present to fill these significant skill gaps

"To fill these gaps the organisation either conducts exams or recruit employees on contractual basis through OPNAL. For the regular employees exams are conducted through a very transparent system, but in case of sourcing contractual employees through OPNAL, the existing employees can refer a person who is registered at OPNAL, and the same can be given prefrence. organisation recruits for permanent position by conducting exams, and through OPNAL for contract labour"

What is the organisation doing at present to fill these significant skill gaps in the local area at the construction site of the project?

"At the local area the organisation does reccruit but again through the same two methods : for regular employees through written exam, and for contractual employees through OPNAL, since it is a government organisation so no personal can recruit on his own as it will be considered as spurious and mode of personal benefit, it is organisations job, as it locals put political pressure for taking them on job, but since it is government organisation so proper channel is followed."

What extra benefits should be given to workers working on the construction site so that more workers participate?

"The workers working on the construction site demand for extra allowance as their primary demand, other than that the addetional benefits that are offered in the terms and conditions laied by the government all thoese are being given to the workers. The contracted employees are also enjoying the same benefits given to the regular employees by the organisation. The benefits given by the contractor to his team members are subjective to what he is offering, but as a part of CSR, the contractors employees can also enjoy the same benefits offered by the organisation but

only at the location site that to only during the working period.; NGO that are operational in local areas maintain good report with local people. These NGO's have gained confidence of local people and have an influence. The HR officer can visit the NGO and propose to keep a seminar where they can be explained about benefis of the project not only to neighbouring area but society at large."

What acitvities should be done by the organisation on the project site location so that more localswish to work with them?

"According to the union workers and the organisation, finidng a good number of employees who wish to work with them is not a very difficult thing to source but the real challenge is the required skill sets and abilities possesed by these who express desire to work with the organisation. More training avenues and methods are to be arranged by the organisation to convert these large number of people into required skilled workforce"

What types of training should be given to the ones who are locally recruited and What are the different ways in which training should be given?

"On the job training methods are usually adopted by the organisation to train the employees. 2. Organisation sends team of employees on a training schedule with workers working in some project in near by state which has same geographical conditions. 3. For regular employees are recruiting them, one year training is given to them. 4. Organisation also might sponser an employee with good calibour; 1. Tie-ups should be made with ITI and tariners. 2. Trainers should be invited on site to give tarining for a certain period of time. 3. Crash course should be conducted for employees. 4. Employees should have joint excersises with project workers working on different site location. if local is recruited, then it is better for him to come to site location and see what work is being done, that ways it is easier to explain and faster to work, if

any local is very good at work, them may be company can send him to training when they send their permanent staff to ITI, so this local can do a small course as well. company can call them to head office for few days for explaining them work, but better purpose will be solved when they themselves see work, if local is recruited, then it is better for him to come to site location and see what work is being done, that ways it is easier to explain and faster to work"

5.15 WITHIN CASE ANALYSIS: CASE 2 – KALIGANGA II

Within Case Analysis in Case 1 – Kaliganga II presents in detail the case study conducted at plant site in Kaliganga II(Rudraprayag), Uttrakhand. The detailed data analysis findings are reported in the subsequent manner on measures and scope of social inclusion to reduce the problem of skill gap in small hydro power sector of Uttrakhand. The findings and details are dicussed in four parts. These parts are divided on the basis of four respondent types (i) Respondents being the contractors (ii) Respondents being the members of Gram Panchayat (iii) Respondents being the members of UJVNL (iv)Respondents being the members of Labor Union.

5.15.1 Respondents being the contractors

Our aim was to find the measures and scope of social inclusion to reduce the problem of skill gap in small hydro power plant of Uttrakhand and ultimately address the problem of Inadequate availability of skilled manpower at the execution stage which is leading to Cost over run and Time over run in Small hydro sector in Uttarakhand. For generating our understanding the contractors were asked certain set of questions on the various measures considered by them to hire local talent. Also, according them what more can be done to address the business problem. Firstly , the researcher inquired about According them,

Which trade set did they find is insufficient?

"Working in association requires us to have responsible people who have been referred to us by our co-contractors. Our duty as main contractors is to provide the small contractors of the site area with petty contracts. They help the not too skilled labourers to earn reasonable living. Also, this is the group of labourers who are found in abundance. However, the ones that require more attention are the skilled workforce such as operators, mechanics, electricians, lineman skilled specifically those of the hilly terrain. There is problem in getting many trade sets because we procure them from different places, but the problem is not insufficieny of workers but finding them with the required skill sets"

Among these trade set which trade sets would you like to procure locally at construction site?

"It must be noted that preference is given more to the ones who are skilled at the local work site, as these have lesser demands in terms of work and stay arrangements, which amounts to their being cheaper. However, the fact that concrete workers and electricians are often difficult to find in remote hilly location sites, cannot be overlooked either. Moreover, we see that these local people themselves wish to be petty contractors instead of trying to become skilled labourers. People who can do construction work can be hired for even electrical works or the masony work.

What are the different strategies do you use to hire the required trade sets at the location site?

"A chain can be seen among the contractors as the main contractor has many small contractors under him who are also called sub contractors. They work mostly on a reference basis. 1. The local government body is informed about the vacancy and are given preference if they have skilled workers to fill these positions. 2. The source for the skilled labourers for these contractors is the labour market. 3. Sharing of Labours among the contractors is often seen as a common

phenomenon 4. The labour working with the contractor is likely to refer a known employee who is later tested and given employement."

What is the purpose of using this strategy?

"Recruitment of an inquisitive workforce is the purpose of this strategy. Also, important is to note that a close contact has to be maintained among different workers, to get an idea of the number of people working and the respective project they are working on. Besides this, it allows us to evade conducting exams to hire masons or electricians as it often roughly tests the referred ones. The bottom line is, that all we have to do is get the work done, given that we have people to work for us."

During what stage is the strategy planned and implimented?

"There arises a need for pre planning immediately after the contract is awarded as well as during the project. Moreover, the contractor either consults the local Gram Panchayat for reference of the required workforce or asks the existing employee of some other petty contractor to help. This is mostly done before hand, but also done during the construction stage (construction stage is a time taking process, it takes years and hence, does not guarantee a consistent set of workers)

Who is the driving force behind each strategy?

"We are open to recommendations from everybody, from the gram panchayat to the contractors as all we have to do is, get the work completed on time. Which is the only way we could get our payment".

Challenges faced by each strategy

"First, the workers who express desire to work may or may not be skilled. Second. the local political pressure to recruit local people makes it complicated as their skills may not match all

the time. Third is the pressure from Organisation for quality workforce. Fourth, managing labor is not easy, they have many problems, wages being the biggest one. For instance, the additional costs incurred for the migrated labour costs the contractors too much. The fifth challenge in this strategy is the eistence of different mind sets, people work for different reasons. While some work only for money, others seek more than money.

Requisites required for each strategy

"A Good contacts with fellow contractors/ Gram Panchayat- maintenance of good relations with fellow contractors and co-workers is of utmost importance To know things like where they are working, what kind of job they are doing or by when their work will complete. b)Training of the local workforce"

What are the benefits that the organisation is seeking from the implimented strategy?

"The major benefit of the strategy is recruitment. As our primary objective is to get the work done effectively as to further receive the payment on time. It is our responsibility to maintain our workforce, for it is where our respect lies"

5.15.2 Respondents being the Members of Gram Panchayat

Our aim is to find the measures and scope of social inclusion to reduce the problem of skill gap in small hydro power plant of Uttrakhand and ultimately address the problem of Inadequate availability of skilled manpower at the execution stage which is leading to Cost over run and Time over run in Small hydro sector in Uttarakhand. For generating our understanding members of Gram Panchayat were asked certain set of questions to understand their views on the various

measures considered by them, that the organization should consider to hire local talent. Also, according them what more can be done to address the business problem.

How much according to you is the willingness of the local people to work for the organization?

"The village gets affected the most during the setting up of the power plant. The local people are willing to work for several reasons, of which one is that they wish to participate in what affects their lives directly or indirectly."

What are the motivating factors for the local people to work for the organization?

"The people will get a steady income which will further serve them with a steady work life. Plus, it will help bolster their confidence as they would now be working for a big organisation. The organisation is likely to have a huge impact on the entire area, in terms of not just money but also through the other facilities the government will offer"

What more facilities should be given by the organisation for people in the local area to attract more workforce?

"The researchers have found out that there are many ways in which the organisation can attract more workforce. For instance, free of cost certificate programmes can be organised for the skilled workforce, in order to further enhance their skills. Second, as a part of compensation the organisation can even wish to offer a position to the dependent member of the family. However, the problem lies in the fact that the person may or may not be skilled to execute the job expected, hence, giving birth to the need for training of such people. Third, the HR Department can tie-up with the vocational institutes present in the local area to help the local workforce attain practical knowledge."

The facilities/ benefits claimed by the organisation are they being received by the local community

The local people get to have a fair share of their benefits since it is a government organisation. However, the same also amounts to a compromised state of their quality. Moreover, timelines remain to be a big issue as they are never met on time.

What benefits must be given for the local community?

"Facilities given to the local workers can be accessed by the local people too. For instance, dispensaries made for the on-site workers can serve even the local people in case of an emergency. They construct houses and boarding facilities for their employees so that it can help even the locals build their homes. They intend to give jobs not only to the affected ones but wish to do so to be able to help enhance the living quality of the normal families as well. For instance, offering knitting opportunities to the women of the house. However, since the Hydro Power Plants are set in remote areas, accessibility and transportation amount to becoming two big problems. Hence, this limits the number of facilities for the development of the area.

What benefits must be given to employees working with organisation from the local community?

There are a couple of benefits that must be given to the employees, such as, free of cost certificates, opportunities to enhance skill, and job security for a steady income. Students who think that they are already being prepared by the institute might not want to receive practical training from an organisation specific to that field. Both, the employees and the local workers receive equal attention in terms of benefits and training, since even the local people working in the organisation are pronounced its employees.

By giving all these benefits to the organisation benefit in return.

The above mentioned benefits are rewarded with benefits like easy access to available skilled workers, a credible database of the potential workforce, prospects of acceptance towards the project and ease in sourcing manpower. Now comes the role of the HR as its responsibility is to figure out how and where to allocate the skills of the workforce. Moreover, this proves to be highly beneficial in cases where the locals back out in the middle of the project or take long leaves to visit their families, since they are residing near the site area itself and hence, the pretext of leaving to visit home does not make sense. This further leads to the fluency of work

5.15.3 Respondents being the Members of Uttrakhand Jal Vidyut Nigam Ltd. (UJVNL)

Our aim is to find the measures and scope of social inclusion to reduce the problem of skill gap in small hydro power plant of Uttrakhand and ultimately address the problem of Inadequate availability of skilled manpower at the execution stage which is leading to Cost over run and Time over run in Small hydro sector in Uttarakhand. For generating our understanding members of UJVNL were asked certain set of questions to understand their views on the various measures considered by them to hire local talent. Also, according them what more on plant site can be done to address the business problem.

According to you, which trade set do you find is insufficient?

It is the technical trade sets which are often noticed to be insufficient (like Welding Skills, surveyor's , Electrician, Sheet Metal Worker, Crane Mechanic ,operators etc.) The problem lies in not the number of employees but the fact whether they are skilled or not. Political pressure makes it mandatory for us to create jobs and offer them to the locals, however, whether they know how to perform the job or not is what amounts to the problem.

Among these trade set which trade sets would you like to procure locally at construction site?

"For procuring locally, skills required have to be matched with the skills present among the local population. The hiring of regular permanent employees, moreover, is done by the HR department. The trade sets which do not require much technical training can be looked for among the prospects at the local level (jobs like masonary, storekeeping, plumbing, painting , etc.) Most of the Hydro projects are based in the Himalayan region and as the seasonal crops are grown there, the off season farmers look for an alternative source of income. This problem can be transformed into an opportunity by lending those farmers a temporary job with the organisation. This will be a win-win situation since neither the workers will ask for long leaves since they would be working in their native place, nor will the organisation have to struggle to find the labour force.

What are the different strategies do you use to hire the required trade sets at the location site?

Three methods are employed for hiring a staff: a) Advertisements and exams for the regular staff. The ones who qualify are offered a regular position. This is followed by their proper training for one whole year. b) Tie-ups with an association called OPNAL for workers recruited on a contractual basis. This association has registration of the retired army personals and alumni of ITI. In case of a requirement, the same is intimated to the organising committee at OPNAL and the most eligible candidate is sent for further scrutiny 3. By Contractor - The contractor hires his team members according to his requirements, in this process the organisation does not play any role, the organisation just checks the quality of the employees hired by the contractor , the contractor may or may not hire locally depending upon his level of satisfaction of the required skill sets that match. Important is to note, that recruitment can be done even as a compensation to those with affected crops- crops can be affected in two ways: a) A permanently damaged land

that can never carry any crop. This calls out for offering permanent employment b) A crop with a temporary damage but with a future possibility to grow. In this case temporary job can be offered till the land can bear crop again.

What is the purpose of using this strategy?

The purpose is to promote transparency in the hiring process. With this, no one could be accused for cheating or being favoured.

During what stage is the strategy planned and implimented?

“In case of regular positions, the organisation must plan in advance because the written examination is conducted and hiring is done on the basis of merit. Thus, the organisation is required to stay prepared already. Contracted employees, on the other hand, are hired as per the requirements. This can be done anytime during the year. Moreover, we also need to discuss energy issues in remote rural areas with the panchayat, to explain to them the importance of having a renewable energy source in vicinity. This can be done by the organisation's surveyors and CSR officers. All they are required to do is, visit the remote location and arrange a discussion with the locals.

Who is the driving force behind each strategy ?

As soon as the project incharges feel the need for an additional employee, they inform the HR Department. The HR Department is the implimenter and the organisation stands to be the benefiter, and while the HR Department and the OPNAL together are facilitators, the HR department is the regulator”

Challenges faced by each strategy

It gets difficult for the regular employees to monitor the lengthy process of conducting exams and checking the results. A close contact has to be kept with the OPNAL association and a quality check needs to be done on the employeeS and their skills sets. Involvement of Social groups is mandatory, however, their not understanding the practicality of the projects and its importance for a larger role, becomes a problem. Communication in local language . Validation of model that defines employment in terms of money because they consider they are being paid less as they have borne losses due to being affected from the project, and money given to them as wages is not enough to cover these losses. Reluctance from HR department and legal advisors to travel to remote locations. Reluctance from locals to learn the required skills as they think that as token of compensation it is their much deserved right to get a job and wages irrespective of their abilities to perform the job. Hence, making it all the more difficult to train them

Requisites required for each strategy

Conducting exams, an agreement with OPNAL by the HR department, the need to check stationery and other resources along with exam schedule are some of the requisites for each strategy. The organisation conducts exams for recruiting permanent positions, and hire through OPNAL for contractual positions. Regular positions require exams that the HR takes care of. It gives ad in the newspaper, and after deciding the date of examination, it finally conducts it (for that what they need is papers, stationary, place to do exam etc) In case of OPNAL, the contract is already signed, all we have to do is, give the requirement details to the HR, which it further communicates to OPNAL. When OPNAL sends us the candidate, we interview them for a quality check by giving them some task to perform in order to gauge his calibre. Furthermore, we

give details to the HR department about the number of people we require and the skill sets we are looking for, then it is the responsibility of the HR department to look into the matter.

What are the benefits that the organization is seeking from the implemented strategy?

The benefits are as follows: Recruitment, either for regular positions or contracted; Sourcing skilled manpower from the local area, earning confidence of locals ; Sourcing of manpower without any recruitment cost as it is part of compensation budget; Developing awareness towards the various benefits of project and creating interest in collectively working towards establishing an energy efficient system.

What are the benefits that the organisation is offering to the community for the implemented strategy?

The organisation in return offers the people a fair Employment opportunity, a steady source of earning along with various other employee benefits extended to their family. It also develops awareness towards the various benefits of a project through advertisements which further helps create interest in collectively working towards establishing an energy efficient system

5.15.4 Respondents being the Members of Labor Union

Our aim is to find the measures and scope of social inclusion to reduce the problem of skill gap in small hydro power plant of Uttrakhand and ultimately address the problem of Inadequate availability of skilled manpower at the execution stage which is leading to Cost over run and Time over run in Small hydro sector in Uttarakhand. For generating our understanding members of Labor Union were asked certain set of questions to understand their views on the various measures considered by them, that the organization should consider in future to hire local talent. Also, according them what more can be done to address the business problem.

According to you, which trade set do you find is insufficient at the construction site of the small hydro power project

Although there is insufficiency in a lot of trade sets at the construction site of projects which induces the existing workers to feel extreme pressure of work. However, the most significant of skill gaps are seen in trades like welding skills, the job of surveyors, electricians, linemen, wiremen, crane mechanics, operators, sheet metal workers etc. Moreover, it is the workers like power house electricians or linemen who are often seen to be short, because most of the burden descends upon them, but they still do not receive extra pay.

What is the organisation doing at present to fill these significant skill gaps?

As mentioned earlier, to fill these gaps the organisation either conducts exams or recruits employees on contractual basis through OPNAL. For the regular employees exams are conducted through a very transparent system, but in case of sourcing contractual employees through OPNAL, the existing employees can refer a person who is registered at OPNAL, and the same can be given preference.

What is the organisation doing at present to fill these significant skill gaps in the local area at the construction site of the project?

Even at the local area the organisation employs the same technique of recruiting through the two known methods of conducting examinations and setting contract employments through OPNAL. Since it is a government organisation, every step is under close observation, thus, no room for unfair affairs is left. However, since the organisation is under a constant pressure of recruiting local people, it is possible that the quality may be sacrificed.

What extra benefits should be given to workers working on the construction site so that more workers participate?

The principal demand of the workers working on the construction site is that for extra allowance. It is important to note that the contracted employees of an organization enjoy the same benefits as its regular employees. Moreover, the benefits given by the contractor to his team members are subjective to what he is offering, but as a part of CSR, the contractor employees can also enjoy the same benefits but only at the location site that too only during the working period. Moreover, NGOs that are operational in local areas maintain a good rapport with the local people. Their intention is to gain confidence of the local people and have a strong influence on them. The HR officer can visit the NGO and propose to keep a seminar where they can be explained the benefits of the projects.

What acitvities should be done by the organisation on the project site location so that more locals wish to work with them?

According to the union workers as well as the organisation, the problem is not finding a good number of employees who wish to work with them but to source those who are genuinely skilled. The solution to this is the distribution of more training avenues and methods by the organisation to convert these large number of people into required skilled workforce

What types of training should be given to the ones who are locally recruited and What are the different ways in which training should be given?

On-the-job training methods are adopted by the organisation to train the employees. Organisation sends a team of employees on a training schedule with workers working in some project in near

by state which has same geographical conditions. One year training is encouraged for regular employees. Organisation also might sponsor an employee with good caliber

For this to take place, it is important to even follow the steps (i) Tie-ups should be made with ITI and trainers (ii) Trainers should be invited on site to impart knowledge for a certain period of time (iii) Crash course should be conducted for employees (iv) Employees should focus on developing joint exercises with project workers working on different site locations. If a local is recruited, then it is better for him to come to site location and see what work is being done, since it makes it easier to explain and faster to work. And if any local is extremely good at some work, he can even be sent for training along with the other employees, where he could participate in some small course.

5.16 CROSS CASE ANALYSIS

This section of the study presents the cross case analysis of Case 1 : Madmaheshwar and Case 2 : Kaliganga II case findings. In the first section similarities and dissimilarities between the two cases studied are presented along with summary of major observations. Then findings of the two case studies are compared for analyzing the various measures of social inclusion to reduce the problem of skill gap in both plant locations.

Table 5.11: Similarities and Dissimilarities between Case 1 & Case 2

	Location	**Madyamaheshwar**	**Kaliganga II**
1	State	Uttarakhand	Uttarakhand
2	District	Rudraprayag	Rudraprayag
3	Tehsil	Ukhimath	Ukhimath
4	Village	Mansuna (near diversion site) Chunni (near power house	

		site)	Khunnu (Kotimaheshwari) – Kavilta
5	Access-road	12 km from Ukhimath by Ukhimath – Mansuna -Jugasu Uniyana road, power house 4 km from Ukhimath	15 kms from Guptkashi by Guptkashi – Kalimath - Jaltala – Chaumasi road
6	Geographical Coordinates Longitude Latitude	53 N/2, 53 N/1 Diversions site Powerhouse site 79^0 06′55″ E 79^0 05′31.59″ E 30^0 32′55″ N 30^0 31′51.76″ N	53 N/2, 53 N/1 Diversion site Powerhouse site 79^0 04′43.35″E 79^0 09′54.27″E 30^0 35′33.23″N$30^0$34′34.65″N
7	Altitude	1240.00 m 1044.50 m	1483 m - 1375 m above mean sea level
8	Manpower planning (Locally)	100 unskilled labours	250 unskilled labors
9	Males	50.32%	50.72%
10	Females	49.68%	49.28%
11	Farmers	➢ 50%	>50%
12	Labours	20%	20%
13	service men	15%	15%
14	business men	5%	5%
15	Artisans	2%	2%
16	and others	8%	8%
17	Male Literacy	36.39%	31.96%
18	Female Literacy	17.13%	9.01%

Case Study 1 **–**The table 5.10 above illustrates the Madhyamaheshwar SHP, that had been recommended for the development as a power generation source in Uttrakhand specifically using the source of renewable energy which would in turn help in rural electrification of the State.

Post commissioning of the Madhyamaheshwar Ganga Small Hydroelectric Project, the electricity formed would be be advantageous in terms of supplying energy in the local rural distribution near the area of Ukhimath, Guptakashi, Mansuna, Giriagaon etc. and regions of un-electrified villages of Kedarnath valley. The energy availability will also improve the voltage profile and reliability of the power system in this remote area in and around holy places like Madhyamaheshwar.

Case Study 2 **–** The table 5.10 above illustrates the Kaliganga-II SHP, that had been recommended for the development as a power generation source in Uttrakhand specifically using the source of renewable energy which would in turn help in rural electrification of the State

the source of renewable energy which would in turn help in rural electrification of the State.

Post commissioning of the Kaliganga II Small Hydroelectric Project, the electricity formed would be be advantageous in terms of supplying energy in the local rural distribution near the area of around Kalimath, Jaltalla, Kavilta, and higher reaches and may provide electricity to remote villages like: Chillond, Chaumasi, Bhooni, Daba etc. The energy availability will also improve the voltage profile and reliability of the power system in this remote area in and around Gaurikund and Holi places like Kedarnath.

5.16.1 Findings – Cross Case Analysis

Analysis of collected data has been cross checked and understood with context to the study in case 1 & case 2 (Madyamaheswar and Kaliganga II) in order to identify similarities and differences in measures of social inclusion during construction stage of small hydro power project in Uttrakhand. By identifying similarities and differences, further insight into issues concerning the various measures of social inclusion during construction stage (analytically) by generalizing the case study results. The details of similarities and differences in findings are given below in table 5.12:

Table 5.12: Similarities and Differences in Findings of case 1 & case 2

Category	Sub-category	Focused Code	Case1- Madhyamaheshwar	Case 2 – Kaliganga II	Similarities (Combined in Case 1+ Case 2)
rehablitaion & resettlment	Employment as a part of compensation	Employment as part of compensation	Yes	Yes	Yes
		Job security	Yes	Yes	Yes
	Engagement of local labour in construction should be mandatory for contractors	Mandatory increase in the % of locals as employee by contractor	Yes	Yes	Yes
	Employment for those with affected crops	Employment for those with affected crops	Yes	Yes	Yes
	Employment for those with seasonal crops	Employment for seasonal crop holders	No	Yes	No
Training	NGO seminars	Conduct preparatory seminar / crash course to increase understanding for exam	Yes	Yes	Yes
	Certification programs	Certified Training	Yes	Yes	Yes
	Traning to a person from affected family	Traning to a person from affected family	Yes	Yes	Yes
	Tie-up with Vocational training institute for	Tie-up with Vocational training	Yes	Yes	Yes

	locals	institute for locals			
curriculum	Understanding & generating awarness of renewable energy	Understanding & generating awarness of renewable energy	Yes	Yes	Yes
	Site Visits	NIL	NIL	NIL	NIL
	Interaction with Industry Experts / Teacher's seminar	Interaction with Industry Experts / Teacher's seminar	Yes	Yes	Yes
	Disuccing local issue	Discussing Local issues	Yes	Yes	Yes
	Proposal - outcome from the study	Conduct preparatory seminar / crash course to increase understanding for exam	Yes	Yes	Yes
Development of Youth	Sponsering of local tournament/sports activity	Liaoning	Yes	Yes	Yes
		Sponsorship – tournament / study / cultural events	Yes	No	No
	Formation of Youth Club	Formation of Youth club	Yes	No	No
	Formation of Youth career counciling center	NIL	NIL	NIL	NIL
	Consruction of playground for locals	Construction of Playground	Yes	No	No
Recruitment Activities	Direct Method	Exam	Yes	Yes	Yes
		OPNAL- an association	Yes	Yes	Yes
		Encourage to join OPNAL	No	Yes	No
	In-Direct Method	Project in charge can be given permission to recruit local on the basis of strong recommendation of his/her abilities for contracted term at work site	Yes	Yes	Yes
		Reference Based	Yes	Yes	Yes

		Sharing Based	Yes	Yes	Yes
Post Recruitment Facilities	Child care services given to women employees	Child care facilities	Yes	No	No
	Transport facilities	School facilities	Yes	Yes	Yes
		Transport facilities	No	Yes	No
	Assistance in opening bank accounts	NIL	NIL	NIL	NIL
	Concession in health facilties to employee and his family	Concession in health facilities	Yes	Yes	Yes
	Concession in electricity bills to employee and his family	Concession in electricity	Yes	Yes	Yes
	Employee & dependents given certified crash course in computer	NIL	NIL	NIL	NIL
	Tie-ups with local Bus services to near by town to give subsidised rates to organisation employees	NIL	NIL	NIL	NIL
	Proposal - outcome from the study	Provision to convert contracted employee in permanent employee	Yes	Yes	Yes
		Food/ Accommodation at construction site	Yes	Yes	Yes
		Accommodation for family at construction site	Yes	No	No
		Extended benefits to employee family	Yes	Yes	Yes
		Extra allowance to work in construction area	Yes	Yes	Yes
CSR (others)	Reparing of Roads	Road repairs	Yes	Yes	Yes
	Construction of Vocational training institute for locals	NIL	NIL	NIL	NIL

	Proposal - outcome from the study	Food/ Accommodation at construction site (in times of natural crisis)	Yes	Yes	Yes
		Drinking water	Yes	No	No

In this chapter above we , have shown the cross case analysis to understand the various measures and scope to reduce the challenge of skill gap in case 1 & case 2. While some constructs were derived from literature review, but most of the constructs were derived from the study. Since, the geographical location of the both cases is similar, so most of the focused codes are combined findings. However, in case 1 – Madhyamaheshwar, since it is of larger potential and capacity, the respondents have expressed more interest in the project. The key findings were also more than case 2. Here, the respondents have discussed some measures which are either proposed or demanded. (i) Drinking Water facilities (ii) Construction of playground for the local population (iii) Child care facilities – since in this region woman are actively involved in work, in such situation it would be more attractive job opportunity. (iv) Accommodation for family at construction site – the plant location is in a hilly terrain which is quite difficult to travel on daily basis. Also, these plant locations are in remote area, which makes it less attractive job opportunity for highly skilled workforce. It was proposed that plant being of higher capacity and time taking construction period, if the skilled workforce workers are permitted to accommodate their family for few months near the plant location. Then the skilled workforce would be interested n the job opportunity. (v)Sponsorships - tournament/ Study / Cultural Events (vi) Formation of youth club – this would help us in two ways. Firstly, as a Benefits to organization it would help us Creating pool of probable candidates. Secondly, as a Benefit to Community it

would help in motivating the youth and binding them together on a common platform, thus giving them opportunity to grow additional skills.

5.17 QUALITY OF EMPIRICAL RESEARCH

Theoretical replication of the observed is given significance here. Hence every description does not require much attention or equal treatment in terms of creditability or acceptableness. As an observer in the study, the researcher must elaborate on the argument in the case for explanation of the theory according to the requirements in the study. The research conducted in the study has focused to give a deep description of various measures and scope of social inclusion to reduce the skill gap practices instead of generalizing as suggested by many other research explorers (Yin, 2003). These kinds of approach in the study are highly discouraged because it would generalize the empirical theory. Hughes and Jones (2003) suggest that approaches which are mentioned would be appropriate and used towards contribution of the knowledge which is existing presently.

For evaluating quality of any research study following tests are used: Construct Validity, External Validity, Reliabilty (Yin, 2003) and details of same are discussed below.

5.18 CONSTRUCT VALIDITY

Ascertain the correct measures for the concepts being studied is referred as construct validity (Yin, 2003). This demands that the selected concepts are measured correctly. Data triangulation addresses the potential problems of construct validity when the evidences are collected from various sources. Few quotes from Yin, 2003 regarding data triangulation are, ‘ it aimed at corroborating the same fact or phenomena’ and ‘ when you have multiple sources that nevertheless addresses different factors’. Gathering evidences from multiple sources essentially

provide ‘multiple measures of the same phenomena’ (Yin, 2003) and ensures ‘stronger substantiation of constructs and hypothesis’ (Eisenhardt, 1989).

As advocated by Yin(2003), the case study reports are reviewed by the key informants. Participant’s feedback is also incorporated in the final case reports. Further, two level of analysis are carried out such as conceptual and detailed during data analysis. This analysis helps to improve the construct validity of the research by triangulation of perspectives on the same data set (theory triangulation) (Patton, 1990). The details of evidence of data collected for Case 1 & Case 2 are presented in the below table 5.13:

Table 5.13: Evidence of data collected for Case 1 & Case 2

Concepts	Categories	Respondents	Evidence Type	Details of Evidence
Scope & Measures of Social Inclusion to reduce the skill gap problem during construction stage in small hydro power sector of Uttrakhand.	Rehabilitation & Resettlement	Contractors , Members of Gram Panchayat at plant location , Members of UJVNL, Members of Labor Union	Interviews, Organizations intranet, Documents, Informal Discussions, Participants Observations,	Audio recordings, field notes of interviews, field observation notes, Root cause Analysis reports, Incident Analysis Reports, Information available on intranet
	Training			
	Curriculum			
	Development for youth			
	Recruitment Activities			
	Post Recruitment Activities			
	CSR			

5.19 EXTERNAL VALIDITY OF THE STUDY

The outcomes from the study may be generic in establishment of the territory in the study, which is described as the External Validity (Yin, 2003). The generalization in a case study results may be strengthened with the application of multiple case study strategy. As per the logic which includes replication in the case study, the design of multiple case studies and cross case analysis is a major step carried out in the research. The similar technique may be utilized for experimental purpose in order to establish the generalization of the theory (Eisenhardt, 1989; Yin , 2003).

5.20 RELIABILITY OF THE STUDY

Assessment of the error committed and the biasness in the research is the basic objective to conduct the reliability test in the study. Procedures in the study like collection of data, may be repeated to create the similar outcomes with help of reliability testing (Yin, 2003). This would imply that if another study uses the similar procedure for collection of data, similar to the study previously conducted, then the new study would conclude the similar results and discussions. Reliability testing of Case1 and Case 2 is discussed in table 5.14 below:

Table 5.14: Reliability testing of Case1 and Case 2

Initial Conceptual Constructs	Sub – Constructs	empirical data	Focused Codes from Empirical Data	Observation on Data Analysis
Rehabilitation & Resettlement	Employment as part of compensation	**Rehabilitation & Resettlement**	monetry valuation Model	Proper documentation was maintained at the organization.
	Engagement of local labor		Employment with additional benefits	
	Employment for those with affected crops due to project		Employment Opportunity	
	Employment for those with seasonal crops			

Training	NGO Seminars	**Training**	generating acceptance towards the project and sourcing manpower	
	Certification Program		Skill Enhancement	
	Training to person from project affected family		Creating pool of probable candidates	
	Tie-up with local vocational training institute			
Curriculum	Interaction with industry experts / Site visits	**Curriculum**	Communication, Facilitator - Project implimentor	
	Generating awareness & understanding of hydro power projects and its importance for society at large		Ongoing activity througout the year	
Development for youth	Sponsorship – local tournament / study / cultural event	**Development for youth**	Implimentor - CSR Department	
	Formation of Youth club / career counseling centre			
	Construction of playground			
Recruitment Activities	Direct recruitment activities	**Recruitment Activities**	Facilitator - HR Department	
	Indirect recruitment activities			
Post - Recruitment Activities	Child care facilities	**Post - Recruitment Activities**	Additional employment benefits	
	Transport facilities			
	Assistance in banking			
	Concession in health facilities			
	Concession in Electricity		NIL	
	Employee's dependent can be sponsored for crash course		NIL	
	Tie-up with local transport facilities for		NIL	

	concession			
	Additional benefits to family		Additional employment benefits	
CSR	Road repairs	**CSR**	Pre - Planning stage of project	
	Vocational training institute		NIL	

For increased creditability and permissible outcomes the validity or the fidelity must be enhanced (Johnson, 1997, p. 283) it might direct towards generalization as a concept suggested by Stenbacka (2001) table 5.13 above describes the structure for both doing and documenting high quality qualitative research. Hence, the nature of the study linked with generalization of the outcomes in order to enhance the creditability and permissibility of the study. Despite the fact that the capability of the outcomes with respects the extensive groups and precedence are most common tests of validity for quantitative research, but Patton (2001) states generalization as one of the criteria for quality case studies depending on the case selected and studied. The study has illustrated reliability testing, seen in table 5.13, in-order to reflect the multiple ways of establishing truth.

5.21 FINDINGS & DISCUSSION – OBJECTIVE 2

The validation in the case study had been done with help of interview method taking guidance from the methods of case study protocol. It further helped in meeting the study'd objective and research questions. Hence, the discussions which are followed by the findings from the case 1 & case 2 are elaborated below. These discussions and findings are based on inputs taken from the various stakeholders involved in the construction phase of the small hydro power project in Uttrakhand, more specifically in the Case 1 and Case 2 of the study.

The noted findings of Case 1 & Case 2 are illustrated below in figure 5.36:

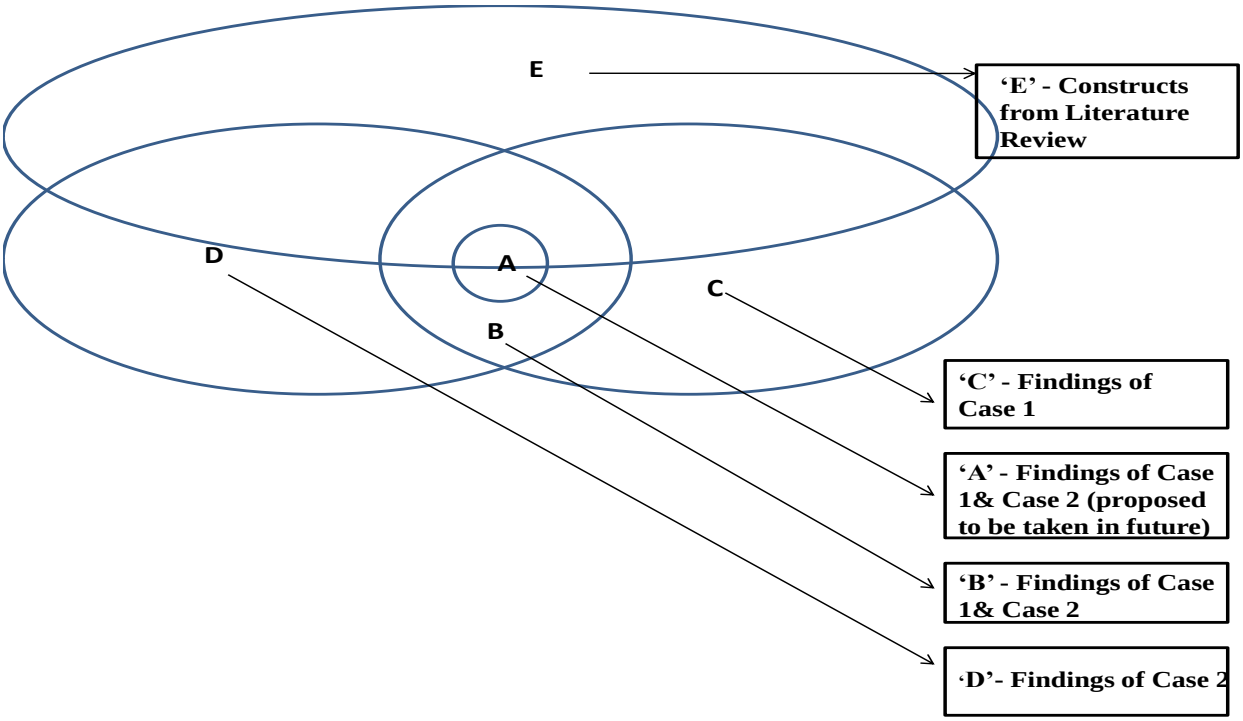


Figure 5.36: Findings of Case 1 & Case 2

From the above figure 5.36; the study draws the findings of the study.

"Section A" demonstrated 'the measures of social inclusion' during construction stage of Case 1 & Case 2 as "Proposed" by the respondents in both cases "combined"

"Section B" demonstrates 'the measures of social inclusion' during construction stage of Case 1 & Case 2 by the respondents in both cases "combined"

"Section C" demonstrates 'the measures of social inclusion' during construction stage of 'only' Case 1 by the respondents in cases area 1; these findings are not outcomes of case 2

"Section D" demonstrates 'the measures of social inclusion' during construction stage of 'only' Case 2 by the respondents in cases area 2; these findings are not outcomes of case 1

"Section E" demonstrates the constructs derived from the literature review as the measures of social inclusion during construction stage but these were not outcomes of on field study. The measures of social inclusion during construction stage are embellished in the table 5.15 below:

Table 5.15: Findings of Case 1 & Case 2

S. No	Section -"B" (Combined)	Section - "A" (Combined - Proposed)	Section – "C" (Madhmeshwar)	Section – "D" (Kaliganga II)	Section – "E" (Literature Review)
1	Exam- as a mode of recruitment	Concession in electricity	Drinking water	Transport facilities	Employment for ones with affected crops
2	OPNAL- an association- as a mode of recruitment	Provision to convert contracted employee in permanent employee	Construction of Playground	Employment for seasonal crop holders	NGO Seminar

3	Reference Based	Liasoning	Child care facilities	Encourage to join OPNAL	Training to person from project affected family
4	Sharing Based	Mandatory increase in the % of locals as employee by contractor	Accommodation for family at construction site		Construction of vocational training institute
5	Job security	Conduct preparatory seminar / crash course to increase understanding for exam	Sponsorship – tournament / study / cultural events		
6	Certified Training	Project in charge can be given permission to recruit local on the basis of strong recommendation of his/her abilities for contracted term at work site	Formation of Youth club		
7	Concession in health facilities				
8	Extra allowance to work in construction area				
9	Extended benefits to employee family				
10	Food/ Accommodation at construction site				
11	Food/ Accommodation at construction site (in times of natural crisis)				
12	Employment as part of compensation				
13	School facilities				
14	Road repairs				
15	Discussing Local issues				

DISCUSSIONS

For the discussion, the researcher would like to discuss in an inwards funnel approach to the figure 6.4 above. The study will initiate with discussion of Section E moving towards Section A.

Section E – The researcher commenced the study with searching for initial constructs, which were outcome from the literature review. These constructs which are detailed in table 6.3 were derived from the literature but did not prove to be outcome from the on-field study. These constructs were suggested by many other researchers, which says they are important in the small hydro business scenario but did not help the researchers study on case 1 – Madyamheshwar and case 2 – Kaliganga II.

Section D – The study has marked the outcomes of case 2 – Kaliganga II zone as section D (Figure6.4). The measures discovered were (i) Transport facilities (ii) Employment for ones with seasonal crops (iii) Encourage joining OPNAL.

The Flash flood occurred in Kaliganga River on 16-17 June 2013 which caused heavy damages in Kaliganga-II SHP. The roads & approaches, weir, power duct, D.Tank, power house and switchyard were completely damaged/ buried and tunnel was partially filled by River borne materials. The flash floods also resulted in losses to the locals in terms of income, livelihood, agriculture and living. Numerous changes were encountered and reported during the construction pahse of the hydro power project. The various changes included the construction of roads on the areas which were earlier agricultural property or the area belonging to the forest, or other developments on the land like bulding of tunnel, buildings etc. Many respondents argued over the lad being uselessly damaged because of carelessness of the construction parties.

Section C – In the figure, the researcher has marked the findings of case 1 – Madhymaheshwar as section C. The measures discovered were findings from the case 1 only. The measures (i) Drinking Water (ii) Construction of playground (iii) Child care facilities (iv) Accommodation for

family at construction site (v) Sponsorships (vi) Formation of Youth Club. The respondents complained of loss of natural water or the problems of water shortage causing a high impact. Many farmers complained for water problems during the irrigation times. While most of them complained about shortage of clean water for drinking purpose. Since construction of power plant is a long term process hence is the water shortage as a problem a long term situation. Therefore, respondents demanded government intervention and projects by government to help in curbing the problems of water shortage.

Further, because of the Flash flood occurred in Kedarnath valley on 16/06/2013 and 17/06/2013 which also caused heavy damages in Madhyamaheshwar and in nearby villages. The roads & approaches, location has been filled with river borne material due to unexpected flood. The power station for Madhyamaheshwar Ganga SHP is proposed to be located on a terrace below the village Chunni. The forebay is proposed to be located very close to Chunni village. Chunni village is located on the Rudraprayag Agastyamuni, Kund, Ukhimath road. The power station site is very easily accessible from Rudraprayag on Rishikesh Kedarnath, National Highway No. 109 up to Kund and then followed by Kund – Chopta Gopeshwar road. The road is motorable.

Another major issue, which was discussed was the climatic conditions in the plant area. As the fact is known that most of the hydro power plant sites are located in remote hilly regions, the climatic conditions of the area are not favorable in all year round. Usually, months from mid-September to mid April are the cold months when for workforce it is difficult to work. Months from mid April to mid July are hot and have favorable conditions for working. Months from mid July to mid September are months of monsoon, when it quite impossible to work at the plant location.

Section B – The study aimed to find the various measure that are required to reduce the skill gap in Case 1 & Case 2. Because of the neighboring geographical location of case 1 & case 2, some measures responded by the various respondents were found to be common in both cases. As a measure of CSR, and the development of area local to the plant location the hydro power

organization may undertake community development projects such as (i) Conduct of exam (ii) Joining through OPNAL (iii) Reference based (iv) Sharing Based (v) Job Security (vi) Certified Training (vii) Concession in health facilities (viii) Extra allowance to work in construction site area (ix) Facilities must be extended to employee facilities (x) Food / Accommodation to at construction site (xi) Employment as part of compensation (xii) Road Repairs (xiii) Discussion of local issues and active participation in times of need. The various samples were account of families which are under the BPL that includes the farmers with small scale agricultural land the people of village who are unemployed and the villagers who belong to the labor category and all the other villagers living in the vicinity of the hydro power project are given many benefits and opportunities for growth by the hydro power organization.

Section A – This part of the study exposes the findings which have been proposed by the respondents of Case 1 & Case 2.

The opportunities for employment with the hydro power organization have been given to the local area people who are affected by the hydro power project and its construction. Most of the employment opportunity for less educated local folks can be in the area of unskilled labor, or temporary labor at the construction area. The young folks who are well educated may be employed in the office as skilled employees after providing them with some basic training on the skills expected from them to display. Another way to help them is by providing them self employment generating skills, example cultivation of mushroom. The locals may also work as contractors as this will give boost to their business and also give the hydro power company a local connect to procurement of different items. The organization at case 1 & case 2 may also indulge in another way to help which would be in formation of women's self help group's along with providing them some basic training. Self-employment activities aimed at providing goods and services to company workers and their families.

5.22 TRIANGULATION (OVERVIEW)

What is Triangulation?

The growing recognition needs to a structural alignment of the derived outcomes of the **quantitative studywith the derived outcomes of thequalitative study**. This complementary approach is is called the method of Triangulation (e.g., Ferreira and Merchant, 1992; Ittner and Larcker, 2001; Shields, 1997) lot of advancements are marching towards this direction, which is supported by various empirical research in management areas. For research in social scientific areas, the concept of the triangulation of the study can be traced to Campbell and Fiske's (1959) when for the assessment of validity of divergent and convergent was done to assess the quantitative methods for multiple aspects Denzin (1978). The process of triangulation of the quantitative method and the qualitative method helps in assesmnet of the depth of convergence and also on complicated divergence of the outcomes of the study (Brewer and Hunter, 1989; Jick, 1979; Sieber, 1973).

Why it is used?

The discussion for the triangulation method is basically **betterment of the validity in research findings** (Brewer and Hunter, 1989; Bryman, 1992; Denzin, 1978; Jick, 1979). Many attempts have been made in the research area of management domain which are associated with survey and case study research to contrast the validity aspects (Abernethy et al., 1999; Birnberg et al., 1990; Brownell, 1995). Moreover, an analytical analysis for triangulation method for bypassing the validity threats have been formulated for general basis on the basis of strengths and weaknesses of different methods (see e.g., Abernethy et al., 1999; Birnberg et al., 1990).

How the process has been followed?

As per the understanding of the study, on the ways of triangulation of the quantitative method and the qualitative method would be used as a measure for validation in the research of management domain. In Section 6.2, describes the three important aspects of validity i.e., the external validity, the internal validity and the construct validity (see e.g., Abernethy et al., 1999; Cook and Campbell, 1979; Yin, 1984). In Section 6.3, the study attempts to combine case study and survey method for the assessment of particular issues in management with view point of the triangulation approach and the ramifications of issues related to the validity raised earlier. In section 6.4 the study describes in detail the findings when the quantitative and qualitative part of study is combined to understand a holistic view.

5.23 TRIANGULATION OF THE STUDY

The first objective of the study was to identifly the significant skill gaps found during the construction stage of small hydro power projects in Uttrakhand. For the first objective, the researcher gathered the data with the help of a questionnaire. The questionnaire was developed on the basis of the Likert's scale. The data derived from the questionnaire method, was then analyzed using software for statistical analysis called the SPSS 21 version. The study until the derivation of the significant skill gaps was quantitative in nature.

Table 5.16: Findings - Quantitative study

Insufficient Trade Sets	**Skill Gap**
	Wireman Skills
	Welding Skills
	Turners Skills
	Surveyor's Skills
	Plumbing Skills
	Operating Skills PLC Systems
	Lineman Skills
	Fitter's Skills
	Electrician
	Draughtsman
	Crane Operating Skills
	Crane Mechanic
	Carpenters Skills

The table 5.16, above reports the findings that the researcher derived from the quantitative study. These findings are the study's basis for further research. Once having derived the significant skill gaps, the study proceeds towards its second objective of inquiring the various measures to reduce

the above derived skill gaps. The second part of study was qualitative in nature, hence was analyzed using software for qualitative tools called Atlat ti 7.0 versions.

The findings of quantitative study journeyed towards the qualitative study and this journey of both study together is explained below in figure 6.1 with help of coding in Atlas ti 7.0 version in order to capture the Triangulation of the study within the framework of social sciences.

In figure 6.1 below, the study has mapped the outcomes of quantitative work directing towards the outcomes of the qualitative study to comprehend in-depth about the development logic using Atalas ti 7.0 software.

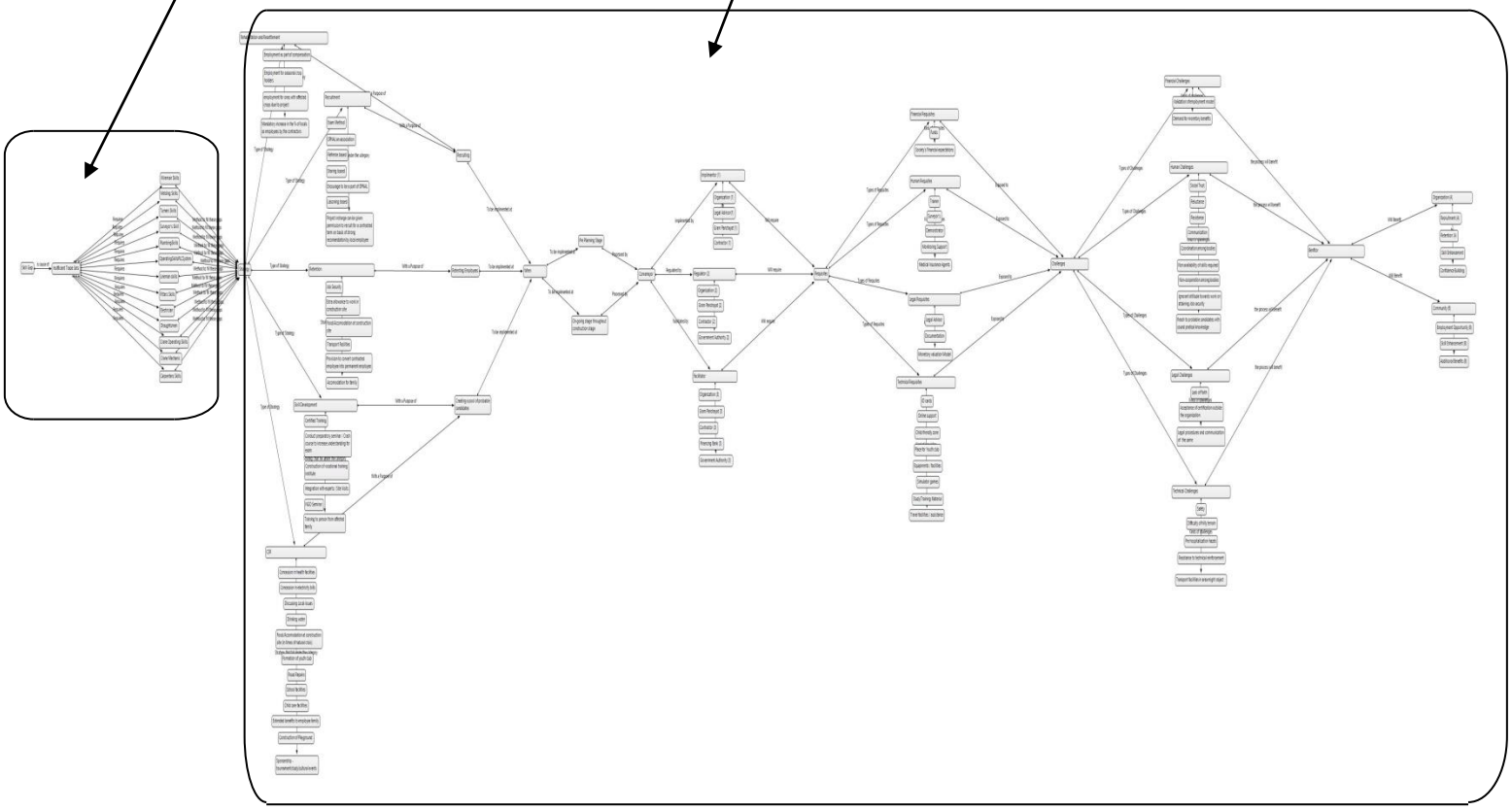


Figure 5.37: Mapping of the outcomes of quantitative work directing towards the outcomes of the qualitative work

In figure 5.37 above, the researcher attempted to derive logic in a behavioral pattern where mapping of relationship between the outcomes of quantitative work and the qualitative inferences. The findings of the quantitative survey serves as the basis for further research work in the qualitative area. Further, the researcher has endeavored to illustrate the "relationship" (marker in inverted coma's example – " are cause of") of each step with the "code" (marker in hash-tag example – #Insufficient trade sets#) elaborately.

Step 1: Keeping our objective in mind, the researcher firstly wanted to recognize the different skill gaps contributing to the business problem. These #skill gaps# "are cause of" certain types of #insufficient trade sets#. (Example in figure 5.38 below)

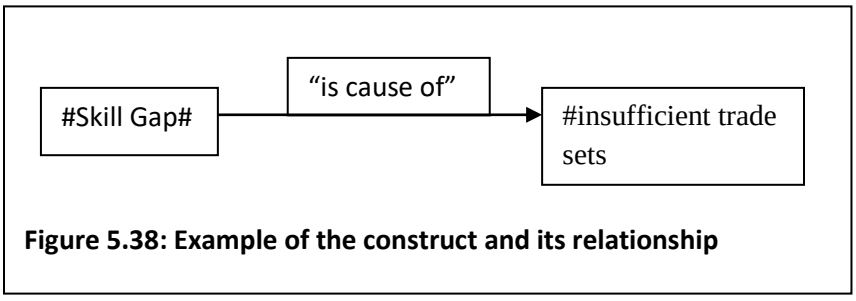


Figure 5.38: Example of the construct and its relationship

Step 2: These #insufficient trade sets# would "require" certain workforce with trade skills # (i) wireman (ii) welding skills (iii) Turners Skills (iv) Surveyor's skills (v) Plumbing skills (vi) Operating skills PLC systems (vii) Lineman skills (viii) Fitter's skills (ix) electrician (x) draughtsman (xi) Crane operating skills (xii) Crane Mechanic (xiii) Carpenter's Skills #.

These deficient skill sets would be required "methods to fill these gaps" with certain #Strategy#

Step 3: The #Strategy# must be well clearly defined into the various "types of strategy" to be used. Which are mainly # (i) Rehabilitation & Resettlement (ii) Recruitment (iii) Retention (iv) Skill Development (v) CSR #.

Further, the each type of strategy has certain specific "strategy that falls under the category".

(i) Rehabilitation & Resettlement - Specific "strategy that falls under the category" are #(i) Employment as part of Compensation (ii) Employment for seasonal crop holders (iii) Employment for the ones with affected crop due to project (iv) Mandatory increase in the % of locals as employees by the contractors #.

(ii) Recruitment - Specific "strategy that falls under the category" are #(i) Exam Method (ii) OPNAL an association (iii) Reference Based (iv) Sharing Based (v) Encourage to be a part of OPNAL (vi) Liaison Based (vii) Project in charge can be given permission to recruit for a contracted term on basis of strong recommendation by local employee #.

(iii) Retention - Specific "strategy that falls under the category" are #(i) Job Security (ii) Extra Allowance to work in construction site (iii) Food / Accommodation at construction site (iv) Transport Facilities (v) Provisions to convert contracted employees into Permanent Employees (vi) Accommodation for family #.

(iv) Skill Development - Specific "strategy that falls under the category" are #(i) Certified Training (ii) Conduct preparatory seminar/ crash course to increase understanding for exam (iii) Construction of vocational training institute (iv) Integration with experts/ Site Visits (v) NGO Seminar (vi) Training to person from affected family #.

(v) CSR - Specific "strategy that falls under the category" are #(i) Concession in health facilities (ii) Concession in Electricity Bills (iii) Discussing Local Issues (iv) Drinking

Water (v) Food/ Accommodation at construction site (in times of natural crisis) (vi) Formation of Youth Clubs (vii) Road Repairs (viii) School Facilities (ix) Child Care Facilities (x) Extended Benefits to Employees Family (xi) Construction of Playground (xii) Sponsorships – tournament/ study / cultural events #.

Step 4: Above mentioned every #Strategy# is formulated "with a purpose of " in alignment with our first step and to reduce the problem of skill gap found during construction stage of small hydro power project of Uttrakhand being mainly #(i) Recruiting (ii) Retention of Employees (iii) Creating a pool of Probable candidates

Figure: 5.39: Relationship between the types of strategy and purpose of formulation

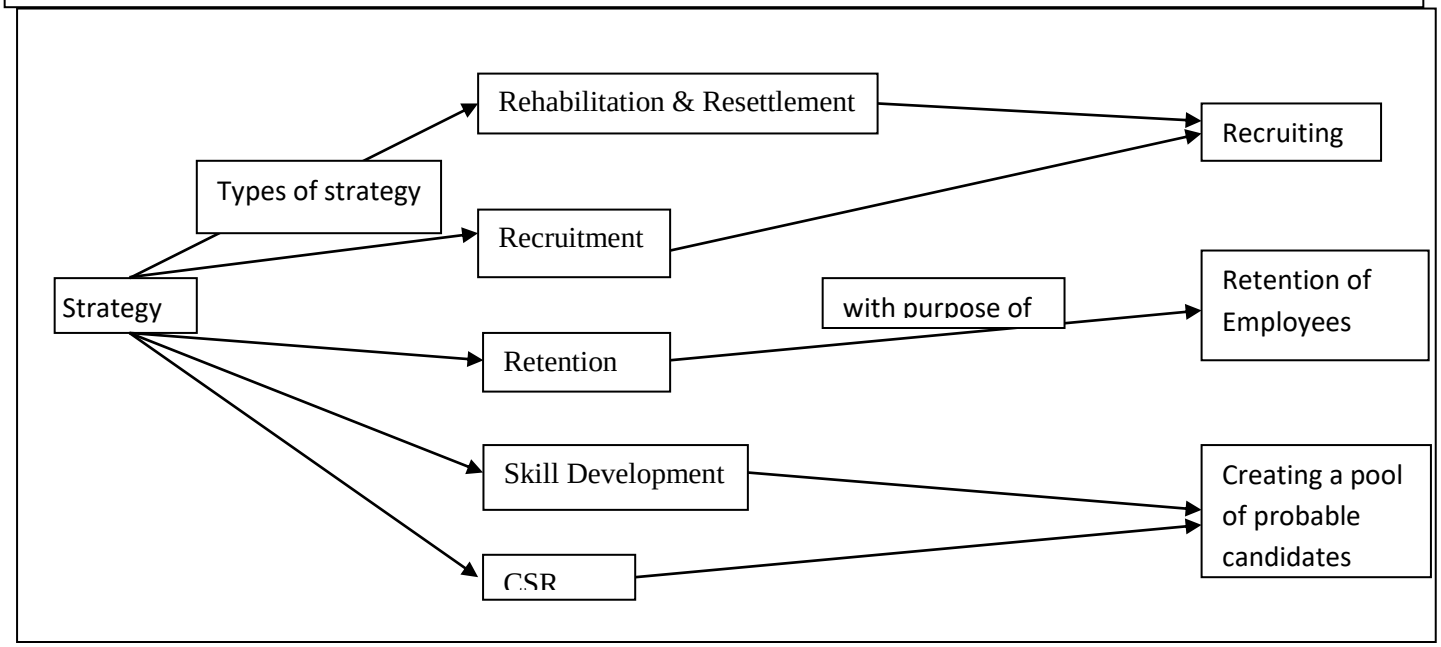


Figure 5.39, illustrates the relationship between the types of strategy and purpose of formulation each one of them.

Step 5: Each strategy is formulated with a purpose as to #When# these are "to be implemented". #When# code directed us the stage when these strategies must "be implement at" i.e #(i) Pre Planning Stage (ii) On-going process throughout the construction stage.

Step 6: Further, once the researcher deciphers as to the stage when these strategies must be exercised they will be "Processed by" a #Conveneyor#. Illustrated in figure Below , conveneyor will be three types, where the strategies will be (i) "implemented by" an #Implementer# (ii) " regulated by a #Regulator# and (iii) "facilitated by" a #Facilitator#.

(i) Implementer – "types of implementer" are #(i) Organization (ii) Legal Advisor (iii) Gram Panchayat (iv) Contractor

(ii) Regulator – "types of regulator" are #(i) Organization (ii) Gram Panchayat (iii) Contractor (iv) Government Authority

(iii) Facilitator – "types of facilitator" are #(i) Organization (ii) Gram Panchayat (iii) Contractor (iv) Financing Bank (v) Government Authority

Step 7: In order to execute the strategies towards solving the skill gap issue, the conveneyor "will require" certain #Requisites#.

Step 8: These requisites are basically four "types of requisites" which are #(i) Financial Requisites (ii) Human Requisites (iii) Legal Requisites (iv) Technical Requisites #.

All these types of requisites have "kinds of requisites" with-in each category.

(i) Financial Requisites – Specifically the "kinds of requisites" are #(i) Funds (ii) Society's Financial Expectations #.

(ii) Human Requisites – Specifically the "kinds of requisites" are #(i)Trainer (ii) Surveyor's (iii) Demonstrators (iv) Monitoring Support (v) Medical Insurance Agents#.

(iii) Legal Requisites – Specifically the "kinds of requisites" are #(i) Legal Advisors (ii) Documentation (iii) Monetary Valuation Model #.

(iv) Technical Requisites – Specifically the "kinds of requisites" are #(i) Id Cards (ii) Online Support (iii) Child Friendly Zone (iv) Place for Youth Club (v) Equipments/ Facilities (vi) Simulator Games (vii) Study Training Material (viii) Travel Facilities/ Assistance #.

Step 9: The kinds of requisites are "exposed to" certain #Challenges# which is further described as "types of challenges" being mainly #(i) Financial Challenges (ii) Human Challenges (iii) Legal Challenges (iv) Technical Challenges #.

All these types of challenges have detailed "kinds of challenges" described under:

(i) Financial Challenges – specifically the "kinds of challenges" are #(i) Validation of Employment Model (ii) Demand for Monetary Benefits #.

(ii) Human Challenges – specifically the "kinds of challenges" are #(i) Social Trust (ii) Reluctance (iii) Resistance (iv) Communication (v) Co-ordination among bodies (vi) Non-availability of Skills required (vii) Ignorant attitude towards work on attaining job security (viii) Reach to probable candidates with sound practical knowledge #.

(iii) Legal Challenges – specifically the "kinds of challenges" are #(i) Lack of Faith (ii) Acceptance of certification outside the organization (iii) Legal procedures and communication of the same #.

(iv) Technical Challenges – specifically the “kinds of challenges” are #(i) Safety (ii) Difficulty of hilly terrain (iii) Pre-hospitalization hazels (iv) Resistance to technical reinforcement

Step 10: Until now, the researcher had been investigating the various skills required to reduce the problem of skill gap, these trade sets could be reduces with help of formulated strategies which are executed on certain project stages with help of certain types of conveneyor’s. These conveneyor’s require some requisites to work efficiently. Working of the same come across certain set of challenges. The entire “process will benefit” a #Benefiter#. Which “will benefit” #(i) Organization (ii) Community #.

(i) Organization – Specifically “types of benefit” to the organization will be #(i) Recruitment (ii) Retention (iii) Skill Enhancement (iv) Confidence Building #.

(ii) Community – Specifically “types of benefit” to the community will be #(i) Employment Opportunity (ii) Skill Enhancement (iii) Additional Benefits #.

Our review reveals how triangulation process helped us map the quantitative study & qualitative analysis. Where the outcomes of quantitative work serves as basis for research in a qualitative way.

5.24FINDINGS (TRIANGULATION)

The study is a mix of two methods of research i.e, The exploratory and descriptive research method was adopted due to the nature of the study. On inclusion of the survey method with the case study method, it will aid in deciphering the process and results of the development by the way on holistic (Tellis, 1997).

The study was divided in two parts, which aimed at primarily two research objectives:

3. To identify activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand.
4. To find out measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand.

Since, the First part of the study aimed to identify activity wise significant skill gaps in the execution stage of Small Hydro Power Projects in Uttrakhand. It required quantitative data and technique to analyze the data. Factor Analysis was performed with help of statistical tool called the SPSS 21 version software. The outcomes and findings of this study served as the basis for further research and journeyed to be the second part of the study.

For the Second part of the study, the study's aim was to find out measures of local participation for ensuring availability of skilled manpower for the identified skill gaps of Small Hydro Power projects of Uttrakhand. It required qualitative nature of study. For the qualitative study to precede the data was collected in the form of conversation, interviews and observations. This data was processed in the form of codes to decipher the discussions with help of qualitative analysis software tool called the Atlas ti 7.0 version.

5.25IMPLICATIONS OF RESEARCH

When deciding to whom the research knowledge should be transferred, the first step should be to ask who can act on the basis of the available research knowledge. The second step should be to ask who can influence those who can act; and the third step should be to ask with which of these target audience(s) we can expect to have the most success and which messages pertain most directly to each of them.

A. Implications at Research Level

The researcher has made an attempt **to a** systematic inquiry that helps to solve business problem i.e; Inadequate availability of skilled manpower at the execution stage is leading to Cost overrun and Time over run in Small hydro sector in Uttarakhand. The research outcomes not only provides strategies for sourcing of manpower requirements from the local geography for the hydro power projects but also suggests strategies which will help the organization to engage with the local community for ensuring a long term sustainable human resource developments. Through this process, the study has explored the measures for the social inclusion in a mutual benefit scenario. Any researcher for further investigation into the sustainability of such inclusion process may adopt the study.

B. Implications at Managerial Level

The research provides an organizing framework for a knowledge-transfer strategy and an overview of understanding of the current knowledge at the managerial level. The research outcomes makes clear that the specifics of a knowledge-transfer strategy must be fine-tuned to the types of decisions management faces and the types of decision-making environments in which they live or work. Since the research has been executed at the level of micro work

breakdown structure of a hydropowerproject, it will enable any other project to map their work force requirement and sourcing strategy at the very implementation level. The Community Integrationrecommendations will develop an organizational strategy in the form of enveloping the whole participation of everyone from the community including political representatives, statutory bodies, businesses, community groups, resident associations, education and training providers and employment initiatives.

C. Implications at Governmental Level

Robert E. Lucas Jr. an economist and Nobel Prize laureate has quoted that if we consider to think about the long-term growth and the development on an economic front, then it is difficult to consider anything else. He also stated that though small differences impact significantly in the rate of the economic front, but maintaining it over a significant period of time can have implications for material living standards. For rapidly increasing the output per person and enhancing the prospects of broad based prosperity, factors other than an aggregate economic growth needs consideration. These need to be for different and local segment of population, which includes relative shift in rates of labor market participation. Now these factors range widely from flexibility of labor markets to the quality of regulatory frameworks. These associated improvements in the standards of living reflect various determinants for example, workers skills, increase in technical know-how, rates of savings and capital accumulation and institutional factors. Implications at the governmental level, affects the long term economic growth in many different ways. It contributes towards a sound functioning labor and growth in a holistic manner for the projects as well as society as a whole.

The argument, which applies particularly strongly to basic or fundamental research, is that the full economic value of a social advance is needed to accrue, especially if the new knowledge can

be replicated or disseminated at low cost. For example, Large scale campaigns like conducting workshops / road shows in major cities (Delhi, Mumbai, Kolkata, Chennai, Hyderabad & Bangalore). These road shows can later be extended to other cities.The information must be well managed among the organizational implementers and local population where the plant is constructed. At every stage of plant construction right from when the exploratory exercise is carried communication between both the parties must be very appropriate and clear. If the community is involved at every stage of the project construction exercise then together the project implementers and the locals can devise significant measures to preserve the archeological, soci-economic valuables. This exercise of the involvement of communities will give the locals a sense of ownership in the project and every stage of construction process will not be taken as a surprise by them. Hence the regulatory bodies and policy makers may consider this work while designing policies for the developments of the industry as well as the local community in long run.

5.26 SUMMARY

This chapter discussed the case study analysis elaborately. Two cases, Case 1 –Madyamaheswar, and Case 2 – Kaliganga II were selected for observing the various measures and scope of social inclusion during construction stage of a small hydro power plant in Uttrakhand. The chapter was initiated with the discussion of the conceptual framework which worked as an aid to beginning of the case study. Based on the constructs derived from the conceptual analysis, a conceptual framework was constructed for generating a basic understanding of the constructs and their relationship in the study. Further, upon conceiving the basic framework of the constructs the study then journeyed towards constituting a structure of case study design for analysis. Here, the study distinctly described the various levels of analysis in case 1 & case 2. Types of respondents were evidently outlined with constitution of case study protocol in accordance to the types of questions to be asked to each type of respondents.

After the data was collected and compiled, the study then moved to its next step of coding the data for in-depth analysis. Coding for case1 & case2 with respect to each type of respondents was done in four steps (i) In Vivo Coding (ii) Open Coding (iii) Axial Coding (iv) Selective Coding. After the coding process, within case analysis was described in detail with respect of each respondent for case 1 & case 2. Furthermore, Cross-Case Analysis has been described and discussed. Similarities and dissimilarities between the two case studies have been discussed in detail. Inferences were drawn from the cross case comparisons and these inferences were converted into propositions.

CHAPTER 6 – RECOMMENDATION

6.0 RECOMMENDATIONS

Observations from both the cases of small hydropower project areas in Uttrakhand, the study realizes that small hydropower projects operate towards the stimulation of the development of local population in soci-economic areas. Nonetheless, the study has observed demanding commitment for improvement of local welfare and environmental viability in the small hydro power project area. For people who are affected with the construction of the hydro power project require a huge participation on community front, their participation and engagement in the decision making process and expression of positive aspects of the development. In order to achieve this, the organization and the community must collaborate and work in close accordance with each other to benefit the society at large. Recommendations from the study have been recommended below in five sections mainly (A) Strengthening Energy Education Programs (B) Free-Flow of Communications (C) The rehabilitation & resettlement (D) Socio-Economic Development (E) Inclusion of Women. These sections are described in details to make certain recommendations from the study.

A. Strengthening Energy Education Programs

Energy education has been and continues to be a rapidly changing field. Education programs need to be responsive to changes in energy technologies and consumption patterns. Energy education is an important tool to develop various energy technologies, information with new energy resources and various opportunities are available in meeting energy requirements. Effort at academic level, school and college and at university level must be needed for energy conservation.

1. **Recommendations for Type 'A' skill gap category**

1.1 Enhancing of the training along with collaboration of the industry – It is very important for any industry to grow that there is close collaboration of the industry and training imparted at institutional level. A proper organized guide must be formulated in order to prepare outline that the industry requires and program for training must be put in place

1.2 Aid mediation in order to engage skills for small hydro power sector- The study points that numerous organizations dealing with small hydro power project must strategize for observing interviews in institutes that offer graduate students and post graduate students. And recruitment activities must be increased with help of below stated activities:

1.2.1 Small Hydro Power Industry Associations may promote collaboration among the organizations and the institutes towards imparting knowledge for producing specific skill holding manpower. Also industry should make a commitment to the institute for recruitment by signing formal contract with the institute.

1.2.2 The institutes and colleges that provide industry specific education must promote themselves and gain attention of the hydro power industry through helping students and on campus job fairs.

1.3 The scheme under which the educators teach must be intensified – The major observed assignment can be to develop teacher training programs and run pilots of these programs to test the potential for cultivating a large pool of current and past

employees of the small hydro power sector with significant experience into certified trainers

1.4 Developing a trainer network – The project implementer organization could develop a database of retired and current employees of the small hydro power industries who could be developed to conduct accredited training programs. When combined with periodic feedback, trainer training and mentoring of these industry veterans based on their performance, an teacher training certification may also be given to such trainers to increase their marketability as a trainer

1.5 The experts who are from the industry may be requested to impart their knowledge to students at the institute. Since, these expirenced folks have a vast practical knowledge base; they may handle latest topics related to projects at small hydro power industry.

1.6 Expediting the on field training program during the summer terms by providing internship opportunities to students on small hydro power technology in industries. Industry should facilitate students in undertaking pilot projects.

1.7 Various courses for training should be developed in regional langyuages as well. And these can be distributed in all ITI's to encourage more people from rural areas to opt for jobs in small hydro power sector.

1.7.1 Promote education of the area in form of internet education program or distance program in small hydro power technologies (Eg. Centre for Distance Education Programme at IIT Bombay).

1.7.2 The new entrants in the industry may be given simulator based training so that they get hands on experience before actually operating heavy machinery.

2. Recommendations for Type ‘B’ skill gap category

2.1 Expedite appreciation and outreach curriculum – The need for facilitation of awareness is strongly being felt in the industry. The main objective should be towards highlighting of the opportunities in the sector and various prospects for career which would make the job options in small hydro power sector looked upon with pride.

2.1.1 Campaigns may by publicized by the small hydro power project implementers , talk shows may be arranged along with show of posters or advertisement of recruitment with help of different modes of communication. For example: the ministry of defense also promotes Join Army Campaign.

2.1.2 Awareness campaigns may be organized inside many institutes by industry experts from the small hydro power energy field.

2.1.3 Large scale campaigns like conducting workshops / road shows in major cities (Delhi, Mumbai, Kolkata, Chennai, Hyderabad & Bangalore). These road shows can later be extended to other cities.

3. Recommendations for Type ‘C’ skill gap category

3.1 An analysis of the required workforce can be made and accordingly a list of aspirants can be made n order to convert them into required skill force. Training may be implemented in the same direction.

3.2 Job fair may be organized in many cities in timely manner in order to attract the attention of skilled workforce. This model has been quite successful in many industries , it may be significant to the requirements as well.

3.3 Create a list of priorities and area that are important: Shortlist priority areas (Important Trades and Regions): Five priority trades - machine builder (fitter), electrician, machinist (including large & precision machining), welder, fabricator (sheet metal worker), those have significant impact on the project must be targeted during the initial phases.

B. Flow of Communication at all levels -

The information must be well managed among the organizational implementers and local population where the plant is constructed. At every stage of plant construction right from when the exploratory exercise is carried communication between both the parties must be very appropriate and clear. If the community is involved at every stage of the project construction exercise then together the project implementers and the locals can devise significant measures to preserve the archeological, soci-economic valuables. This excersice of the involvement of communities will give the locals a sense of ownership in the project and ecvery stage of construction process will not be taken as a surprise by them. Some measure relating to this are;

1. At local level, amongst the the panchayat members, one member can be appointed to be a liason between the local community and project implimentors.
2. A local office can install a communication box at the local panchayat office or local school, where local people can keep their post mail to communicate their thoughts with the project implimentors.
3. Local NGO, support can be taken for effective communication at every step implementation stage of the project development.

4. Project implementation officers must visit the local committee regularly for addressing the local population.
5. Formation of youth club, that can serve as a tool for communication between the project implementers and local youth, also project implementers can identify possible skills sets that can be used at the project site.

C. The Rehabilitation and Resettlement

Although the government of Uttrakhand a has very specific laid-down procedures for the resettlement and rehabilitation of the project affected persons. According to our study, restoration of pre-project levels of income is an important part of rehabilitating the socio-economic and cultural systems in affected communities. Our study also has suggests measures that will be helpful;

1. Short term assistance through allowances / assistance grants
2. Assist in identifying self-employment options.
3. To promote traded in local region, procurement of daily need goods must be taken from local market. The influx of people from outside for the project construction will be buying the local products such as food, vegetable, etc. Therefore, a readymade market will be emerged for the local products and people can sell their product easily.
4. A small shopping area can be opened within project complex for the project employees and the responsibility to run those shops must be handed over to the affected local people.
5. The contractor will give preference in jobs to people affected by the project

D. Inclusion of Women

In the state Uttrakhand, the women are majorly involved in the work which is related to household. They mostly do the domestic work. But women who live in the rural regions not only involve themselves in the household activities but also the activities related to agriculture. Though the participation of women on the economic front is comparatively much lesser, but the construction of the power project affects them in many ways. For example, they face loss in livelihoods during the phase when transition is taking place at the plant location and benefits to the affected ones are delivered. It is observed that the process of giving them due benefits is a lengthy process.

1. Every team which will be deployed in the project area must include a women atleast to investigate or act as a facilitator . This chooses women must be representative of local population who must also belong to the same area.
2. The implementers of the project or the officer who is in-charge of the project must ensure that all the women who are living in the project area are consulted and encouraged to participate in the activities which are group based.
3. At least one women as a representative from local population must act as representative of the other women in the monitoring and evaluating activities.
4. Further, during project implementation, selected NGOs will make sure that local women actually take part in issuing identity cards, opening bank accounts, receiving compensation to project affected people.

6.1 REVISITING THE THEORITICAL FRAMEWORK

The theory of partnership was considered as the under pinning theory for the study. Detailed interpretation of the theory and its relationship with the study has been elucidated. Furthermore, the contribution to the theory from the study has also been described in detail.

Theory of Partnership

In the last ten years, the concept of partnering is becoming considerably popular. Yet despite of the popularity, the various researches have drawn rich debate on the combative concern over the concept of partnering when applied in practicality. Distict studies (Granberg et al. 1999; Larsons 1995; Westons and Gibbson 1993) with a surfeit unreliable confirmation back the advocation of the concept of partnering. While many studies highlight the practicability of indulging in partnership specifically for value chain and supply wich would include sub contractors as well. (Kale and Arditi 2001; Love 1997; Mathews et al. 1996; Miller et al. 2002; Sze et al. 2003). Many stories of success highlighting the partnering concept have appeared from many varied cultural areas. (Bayliss et al. 2004; Bennett and Baird 2001; Chan et al. 2004b) The concept of partnering is varyingly defined with refrence to the outcomes or the course muddled with the ways of implementation as demonstrated to be a structural process composed to enhance cooperation among the parties in partnership (Crowley and Karim 1995)

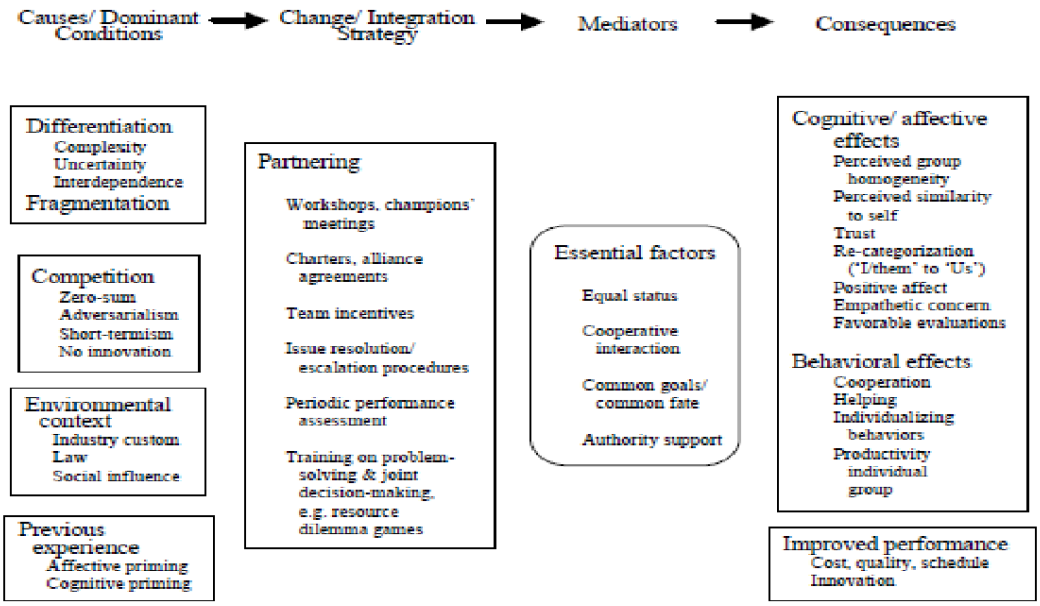
As per the study conducted by Rowlinson and Phua (2004), the term partnering indicates towards enhanced cooperation in the construction industry. Lovee et al. (2002) suggest that the concept of partnering and the term partnering is just a synonum for a well crafted strategic collaboration. Brooke and Litwin (1997); Cheng and Li (2001); Crane et al. (1997); Wilson et al. (1995) interpret and classify the different steps during the advancement in the liaisons of the parties in partnership Ellison and Miller (1995); Nyström (2005); Thompson and Sanders (1998); as an

alternative explain the expidite design for exchanging resources and making decisions by the parties in partnering collaboration (Cheng et al., 2001; Crowley and Karim,1995).

The Industry Context

The theory of partnership and its model has a relationship to the context of the construction industry. Figure 7.1 explains its each step of the partnership model with the industry context below:

Figure 6.1: Model in partnering with the implications on the performance of the project (adapted from Gaertner et al. 1993)



In figure 6.1 , the study establishes a relationship of the constructs from the partnership model with context to the construction industry. In first column from the left the construct is the concept of Differentiation with respect to the construction industry, more specifically referring to the sub contractors as a feedback towards ambiguity originating in intricacy (Eccles 1981). Hence a situation with interconnection may be conceived thus acting as a barrier to inter-

cooperation for success in the projects in construction stage. The intricacy, ambiguity and inter reliance have compelling connotation for the organization, and coordination in the projects during construction phase (Dubois and Gadde 2002; Eccles 1981a; Gidado 1996; Shirazi et al. 1996; Winch 2003). Usually, the strategies in construction phase, e.g., Competiveness in tendering, the contracts which involve the manipulative incentives related to performance and the communities in practice of the industry permit many uncertain dimensions which needs addressing when in a situation to guard the opportunistic behavior (Bradach and Eccles 1989; Dubois and Gadde 2002).

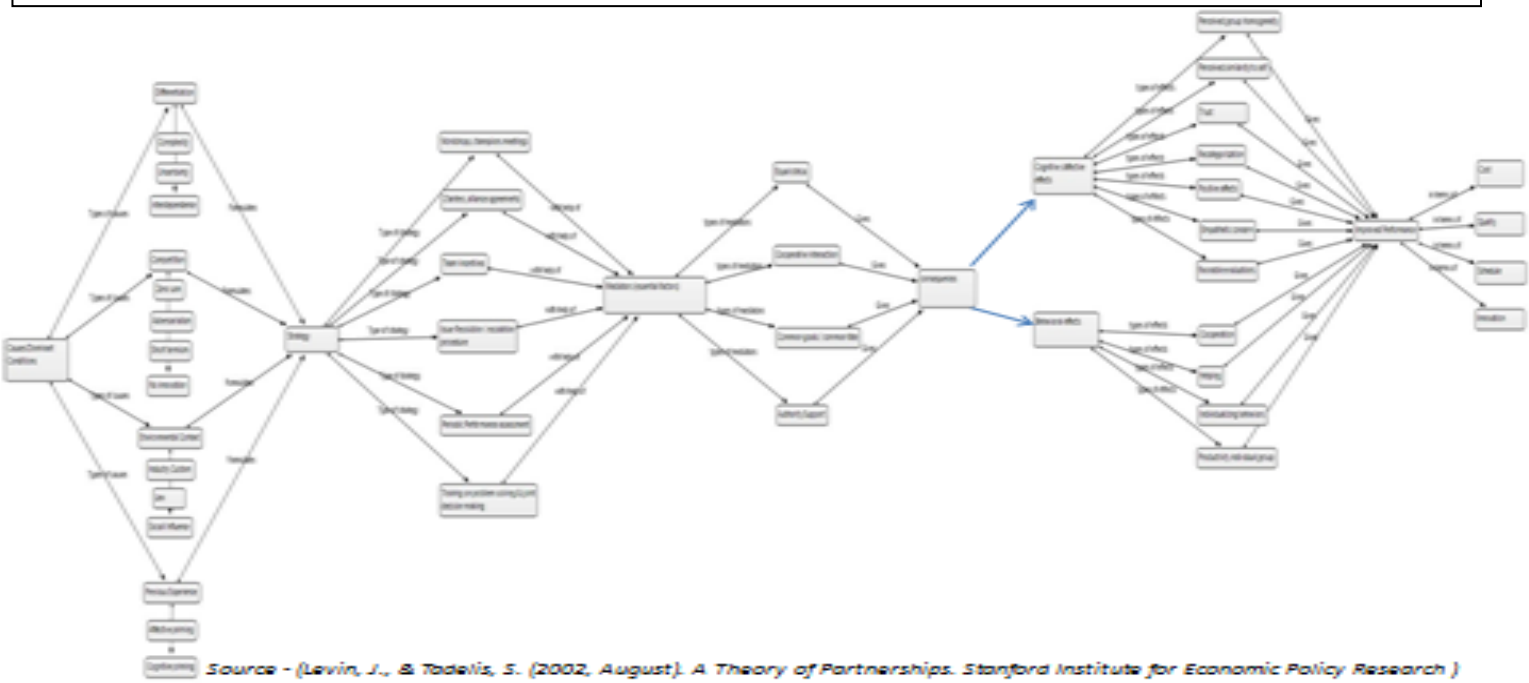
In due course of time, the adverse accords and approach are becoming regularized i.e., Affective priming as combination of fashion in the construction industry (CIRC 2001; Egan 1998). Hence resulting in conventionalizing with one another and of the business along with ageism among the different stakeholders i.e., Cognitive Priming, constraining the collaboration in future (Moore and Dainty 2001). This detrimental fashion is to be partially blamed in the destitute uptake of the new processed and strategies in management for the construction industry (Bresnen and Marshall 2001). Hence, with reference the concept of partnering was perceived and popularized. The concept of partnering administers a state of co-operation in the industry when pressure is felt from professional point of view and also in adversative collaborations. As per the various theories, arrangement of community into definite association in ample in itself for creation of inhume group for business and social work. Further, aspects that enhance intergroup bias influence to boost the protuberance of the classified presentation (Tajfel and Turner, 1979).

In the next section explains, on the basis of the proposed model. Conceptualization was done considering the key components as constructs and associative network diagram was derived using Atlas ti 7.0 software for creating an in-depth understanding.

6.1.1 THEORY OF PARTERSHIP (BEHAVIORAL RELATIONSHIP)

According to, Sherif and Sherif (1966) Corporate and social patterns along with the effects of situations in contact with the partnership and According to Wilner et al. (1955), cited in Pettigrew (1998), "contact and perceived social climate tend to reinforce each other when their influence operates in the same direction, and to cancel each other out when their influence works in the opposite direction".

Figure 6.2: Explaining the Key Components of the Theory of Partnership (Behavioral Relationship) (Appendix)



Source - (Levin, J., & Tadelis, S. (2002, August). A Theory of Partnerships. Stanford Institute for Economic Policy Research)

Figure 6.2 illustrates the behavioral relationship of the constructs in the model of partnership. The study established the behavioral relationship among the key constructs in order to understand the relationship of each construct with context to the study. Below is detailed alignment of the initial constructs of the theory of partnership with the study

Cause / Dominant conditions - The tools for the exercise are derived, in large part, from experiences but what is created by their generative use is not reducible to those experiences. Human action, being socially situated, is the product of a dynamic interplay of personal and situational influences.

The various types of causes are explained in below given table 6.1 with relationship to the study.

Table 6.1: Causes /Dominant Conditions for Skill Gap

According to theory	**Defination**	**According to Organization**	**According to Community**
Differentiation			
Complexity	Complicated process or situation	After getting job security, ignorant attitude towards job at remote locations	Contractors want to recruit mostly in contractual basis so that when the project is over, they don't need to carry the workforce and give benefits
Uncertainity	Unreliable / Dilema	Job rotation must be transparent and fair among contractual and permanent employees	No job security
Interdependence	mutually reliant/ process on being dependent	Recruitment is done in two ways either through exam, or OPNAL and association where employees are hired for contracts, but for construction work organization is mostly dependent on contractors	Contractors are often seen sharing workforce
Fragmentation	Disintegration or breakdown of norms of thought, behavior or social relationship	Work is very mechanical process in remote locations where activity are less, so employees don't prefer to stay for longer duration	Sharing of labor and refrencing is commonly seen among contractors, but for organization they must work towards

			building social confidence.
Competition			
Zero-Sum	A situation in which watever is gained by one side is lost by the other, Zero sum game theory in game thoery and economic theory a mathematical reprsentation of a situation in which each participants gain or loss of utility is exactly balanced by the other participants	Employees don't want to stay in remote location for longer duration as they lose time with family	Organization is concered about the project, where as community also has demands
Adversarialism	Any inquiry brought by one party against another in which the party seeks relief	Senior permanent employees prefer less traveling to site locations	community has been afected by the project, but they have not all been compensated satisfactorily
Short termism	Excessive focus on short term results at the expense of long term investment	Employees focus on working for short term and get extra incentives, they don't consider organizational goal as their own to work till the completion of project	Seasonal Employment
No innovation	No change, no reorganization, no restructuring / rearrangement	Geographical location is such	Employment is mostly in contractual terms in the same area, so nothing new in terms of work environment
Environmental Context			
Industry Custom	Rules laid by organization, not concerned about geographical location	Mode of recruitment done by organization	Mode of recruitment done by organization
Social Influence	Occurs when persons emotions, bahavior are affected by others, peer pressure, leadership persuation	Ignorant attitude toward job work because of job security	Employment for affected family

Previous Experience			
Affective Priming	The phenomena of attitude formation, change acts as a guide to social behavior	Ignorant attitude toward job work because of job security	Employment for affected family they feel that they are not satisfactorily compensated and demand permanent job
Cognitive priming	Cognatice traits-memory, learning or attention, measuring behavioral reactions and cognative self respect	New entrants pay experienced higher increment, spoil the equal market labor distribution	Refrence base startegy, labors refer their known

The above table 6.1 gives detailed description of types of causes/ Dominant Conditions with direct context/ relationship to the study which further help in further "formulation" of "Strategy".

Strategy - As human being has a potential to do right and wrong, each state, due to the situation, can choose one of the above as well. A strategic partnership – a new type of bilateral relations that combines a flexibility and deep rapprochement has become a supplement for the fairly negotiations on the various pressing issues. The dramatic intimacy of the topic is outcome of sharing of mutually formulated strategies and acceptance of common goals for a lengthy collaboration would expedite its implimentations. These give conception to various "types of strategies" that the researcher studied in context to the study Table 6.2.

Table 6.2: Change / Integration Strategy

According to theory	**Defination**	**According to Organization**	**According to Community**
Workshops, champions meetings		Certified Training	Conduct preparatory seminar / Cras understanding for exam
		Integration with experts / Site Visits	Construction of vocational training institute

	Construction of vocational training institute	Training to person from affected family
Charters, Alliance agreements	OPNAL an association	Formation of youth club
	Encourage to be a part of OPNAL	Refrence based/ Sharing based
Team incentives	Extra allowance to work in construction site	Provision to convert contracted employee into permanent employee
Issue resolution / escalation procedures	Discusion with superiors	Discussing Local issues
Periodic performance assessment	Provision to convert contracted employee into permanent employee	Provision to convert contracted employee into permanent employee
Training	Certified Training	Conduct preparatory seminar / Crash course to increase understanding for exam
	Integration with experts / Site Visits	Training to person from affected family

In the above table 6.2 are detailed "Types of Strategies" these are the major key components of partnering practice (Hellard 1995; Schultzel and Unruh 1996; Thomas and Thomas 2005) (i) Workshops, Champions meeting (ii) Charters, Alliance agreements (iii) Team Incentives (iv) Issue Resolution/ Escalation procedures (v) Periodic Performance Assessment (vi) Training on problem solving & Joint Decision Making.

The partnering workshops and periodic champions' meetings provide opportunities for project workgroups to interact in a cooperative and nonthreatening environment. These interactions kick-start the process of learning about and understanding one another's interests and concerns, which ultimately enables the project actors to collectively create, shape, and own a set of common goals and approach for the project (Katzenbach and Smith 1993; Pettigrew 1998). Senior management's expression of support for this process is crucial for its success. Selecting members with the necessary technical or functional expertise is important not least because

competence strongly predicts task performance (Motowidlo and Van Scotter 1994) and trust (Das and Teng 1998). Training, expert facilitation, and coaching help this process by encouraging honest and frank communication and problem solving in workgroups (Drew and Coulson-Thomas 1996; Katzenbach and Smith 1993). The champions' meetings serve to perpetuate this commitment building or realignment process throughout the life of the project.

These 'types of strategies' can be achieved "with help of" few "Mediators".

Mediators

A mediator is a component that is engaged between two parties that have required the services of the other. For achieving this purpose, the mediator will seek the necessary information from the type of strategy to be used and the consequences from it. These give conception to various "types of mediators" that the researcher studied in context to the study as illustrated in Table 6.3.

Table 6.3: Mediators (Essential Factor)

According to theory	Defination	According to Organization	According to Community
Equal Status	same social level as you or group who has a similar background, history, social role, and education	Provision to convert contracted employees to permanent	Training to person from affected family
		Benefits given to parmanent employees are given to contracted employees as well as local employees of that area	Benefits given to local community
		Mandatory increase in % of employees from local area for contractors	Conduct preparatory seminar / Crash course to increase understanding for exam

Cooperative Interaction	Cooperation is the process of groups of organisms working or acting together for common goal	Involvement of stakeholders / nonstake holders equally in strategy as implimentors, facilitators, regulator	Discussion of local issues
		Different modes of giving employment opportunity	Formation of youth club
Common goals/ Common fate		Equal benefits for everyone associated with organization	Additional benefits given by organization
		Employment opportunity under different modes of recruitment	Employment opportunity
Authority Support		Parts played in different strategy by different stakeholders like - Goverrntment, gram panchayat, contractor, organization as implimentors, facilitators and regulator	Parts played in different strategy by different stakeholders like - Goverrntment, gram panchayat, contractor, organization as implimentors, facilitators and regulator

In the above table 6.3, we can see the four types of mediators (i) Equal Status (ii) Co-operative interaction (iii) Common Goals / Common Fate (iv) Authority Support. These constructs and their relationship with refrence to the study is described in the table 7.3. Here each construct with their role in relationship to the organization (stakeholders) and the community (non-stakeholders) has been illustrated,

Consequences - Consequences "is cause of" two basic effects (i) Cognitive /Affective Effects (ii) Behavioral Effects. The detailed description of the consequences with respect to the study is illustrated in table 6.4 below.

Table 6.4: Consequences			
According to theory	**Defination**	**According to Organization**	**According to Community**
Cognative effects			
Percived group homogeneity	group homogeneity effect has been found using a wide variety of different social groups, from political and racial groups to age and gender groups, percived means perception among such groups. Perceivers tend to have impressions about the diversity or variability of group members related to attitude, expectations, work setting, similarity ect.	All CSR measures taken by the organization is to build a positive perception	Community is more concerned with quatifiable benefits given by organization like, no of jobs given, and additional benefits given
Percived similarity to self	perceived similarity in personality, attitudes, interests, and religious affiliation	Equal employment opportunity	Locals are also proposed to give most of the benefits given to employees
Trust	firm belief	All CSR measures taken by the organization is to build a Social trust and confidence towards organization	All CSR measures taken by the organization is to build a Social trust and confidence towards organization
Recategorization (I to us)	to arrange in categories or classes	Provision to convert contracted employees to permanent	Concession in health facilities , Travel facilities
Positive affects	individual subjectively experiences satisfactory	Encourgement to joing OPNAL, give exam and give support for prepration	Involvement of local gram panchayat, and organization poposing construction of playground and giving other facilities
Empathetic Concerns	refers to other-oriented emotions elicited by and congruent with the perceived welfare of someone in need.	Food/Accomodation at construction site (in times of natural crisis)	Food/Accomodation at construction site (in times of natural crisis)

Favorable evaluations		Proper categorization of employees as regualr, contracted and local, and local people who are not employees and proposing strategies specific to their needs and conditions	Discussion of local issues and proposing benefits based on discussions
Behavioral effects			
Cooperation		Additional benefits given	Refrence based and sharing based strategy
Helping		Food/Accomodation at construction site (in times of natural crisis)	Sponserhip - tournament, study, cultural events
Individualizing Behavior	consider or treat individually	employment for ones with affected crops / seasonal crops	Formation of youth club and participation

We can see that the 'Consequences' usually "is cause of" two types of effects mainly (i) Cognitive / Affective Effects and (ii) Behavioral Effects. These are further classified into "types of effects". In case of (i) Cognitive / Affective Effects – It means the emotional or psychological role played by the stakeholders in the study. It has further seven sub constructs (i.i) Perceived group of homogeneity (i.ii) Perceived similarity to self (i.iii) Trust (i.iv) Re-categorization (i.v) Positive Affects (i.vi) Empathetic Concerns (i.vii) Favorable Evaluations. Furthermore, the second key construct in the consequences section of table 6.4 is the role of Behavioral Effects with respect to the study. The sub constructs are (ii.i) Co-operation (ii.ii) Helping (ii.iii) Individualizing Behaviors (ii.iv) Productivity Individual Growth. This sub constructs and their role played by stakeholders and non stakeholders is described in the table 6.4. These all within the partnership framework "gives" the partnering stakeholders "Improved Performance"

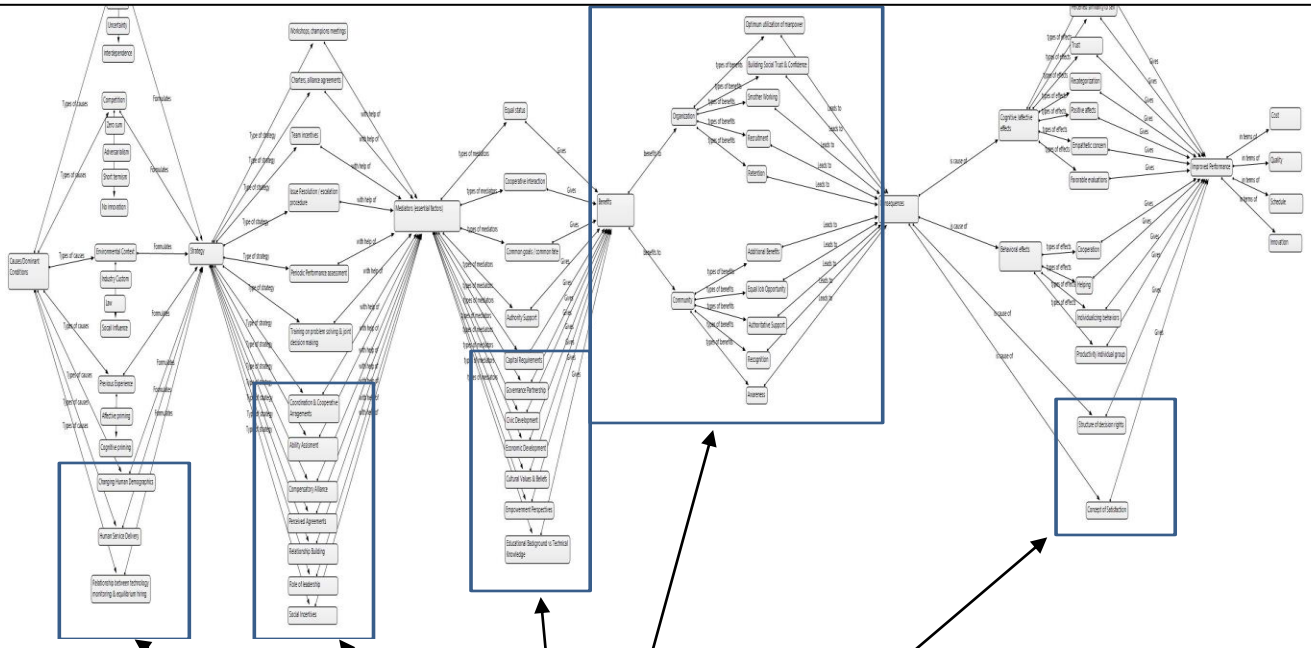
Improved Performance

The “improved performance” is “in terms of” categories mainly being the Cost, Quality, Schedule and Innovation.

6.2 CONTRIBUTION TO THE THEORITICAL FRAMEWORK

The study explores some of the theoretical issues concerning the reasons for developing and operating partnerships. In particular partnership with aim to promote the stakeholder's and non-stakeholder's regeneration or economic development. These are analyzed as these involve a wide range of actors (including central or federal government, local government, the private sector, and local communities) and the underlying issues that they deal with are multifaceted. Many case-studies of such partnerships exist (see for example, Wannop, 1990). The theoretical basis for understanding and analyzing is explained in figure 6.3 below.

Figure 6.3: Explaining the "NEW" Key Components of the Theory of Partnership (Behavioral Relationship) (Appendix)



In the 'Theory of Partnership', it is briefly outlined in a very basic form to illustrate the pressures aiding or hindering co-operation between stakeholders with non-stakeholders in social regeneration and economic development. In figure 6.3, the constructs marked in the box are newly observed, which serves as the contribution to the theory of partnership during the study.

Hence the study suggests some of those burdens contributing towards the impeding co-operation within the stakeholders and non – stakeholders specifically when they have some differentiated objectives. The argument then directs towards describing of application of the observed constructs of the theory of partnership to ensure effective collaboration.

A. Cause/ Dominant Conditions - Actions of human beings are dominant in nature to the socio ecological framework, where acceptance of the same is just a societal component (Walker et al., 2004). The approach accentuates the significance of comprehending knowledge owned by different stakeholders collaborating in resource management. The constructs derived are (i) Human Dynamic Proportion (ii) Technological Alliance. The construct Human Dynamic Proportion, has further two sub-constructs (i.i) Changing Human Demographics (i.ii) Human Service Delivery.

    1.1 Human Dynamic Proposition – It is information within a framework which provides important tools required in order to understand the each other's abilities, for increasing collaboration and relationships among partners

    1.2 Changing Human Demographics - According to theory, the demography explains the study of people and their population. The changing demography describes the change in health of people on various aspects.

B. Strategy –stakeholders and non stakeholders need to reflect on the partnership processes and their meaning for stakeholders and non-stakeholders behavior, since knowledge is contextual-existing in relation to the place in which they occur, the experiences from which they arise, and the cultures with which they are associated (Keen and Mahanty, 2006).Hence, every step towards the hand of partnership must be strategized in order to benefit at best. The constructs observed are (1) Social Enticement (2) Capacity Building

(3) Socio-Civic Relationship are explained below in detail to describe the behavioral relationship of the new observed constructs with the stakeholders and non stakeholders in the study.

1. Social Enticement – It is a form of social influence. It is the process of guiding people toward the adoption of an idea, attitude, or action by rational and symbolic means. It is strategy of problem-solving relying on "appeals" rather than strength. Social persuasion leverages the process of enticement to accomplish an aim. Sub constructs from the study involve (i) Compensatory Alliance (ii) Role of Leadership (iii) Relationship Building

1.1 Compensatory Alliance - Alliances have been referred to by many other terms such as symbiotic marketing, horizontal integration, collaboration, or strategic partnerships. Successful alliances build and improve a collaborative advantage by first acknowledging and then effectively managing the human aspects of their alliances.

1.2 Role of Leadership - Leaders must initiate the commitment to be created in the alliance by encouraging information sharing, trust, reciprocity and cooperation for success. The alliance leaders should have the ability to inspire to be able to fulfill these tasks to create true partnership and launch in joint operations. A common vision of the followers and enabling them to accept central values requires a kind of transformational and visionary leadership, and demonstration of a comparatively strong impact.

1.3 Relationship Building - The study had identified three main attributes that should be present in pedagogy: (a) "willingness of a learner to be actively involved in the experience," (b) "opportunity to reflect on the experience," and (c) "ability to use

problem solving and decision-making skills to implement new ideas gained from the experience". Simplified and applied to a classroom setting, the experiential learning process should include activity requiring active participation (*experience*), an opportunity for students to contemplate their experience (*reflection*), discussion to help students "identify patterns and gather insights with[in] the context of their experience" (*debriefing*), and identification of "how the information and skills learned can be applied to other life experiences" (*application*).

2. Capacity Building - Every society, every community, every group and every person has skills, strengths and the capacity to problem solve, act creatively and work together for the benefit of their group. By the study 'Capacity Building' is defined as the interaction of human capital, stakeholder's resources, and social capital existing within the non stakeholder's that can be leveraged to solve collective problems to improve or maintain the well being of stakeholder's and non stakeholder's in a mutual benefit scenario. It may operate through informal social processes and/or organized effort (Chaskin, 2001). Local social networks may overlap with formal partnerships, and add incentives to them succeeding, although there is a danger of 'favoritism' amongst those in the network. Also numerous ways of establishing mutual benfit scenario among the stakeholders and non stakeholders may set up specialist divisions to develop partnerships with local authorities and others, especially in economic regeneration involving construction or as a means of getting access to development opportunities

3. Social-Civic Relationship – The study would like to highlight a third term, which must be added–for theoretical reasons. The term is "relationships," but I would

narrow it to specifically Socio-civic relationships. Socio-Civic relationships generate power, they build communities, they reflect values and principles, and they are intrinsically rewarding. A Socio-civic relationship need not be "civil," if that implies politeness and frequent expressions of positive emotions. It can rather encompass sharp disagreements. But the relationship must be predicated on the value of the other person as a fellow citizen, seen as someone who should be encouraged to participate in the common life. Thus Socio-civic relationships are connected to particular social and civic virtues, including loyalty and hope. The sub constructs are (i) Governance Partnership (ii) Perceived Agreement

3.1 Governance Partnership – Sustainable and effective development is dependent on ensuring the strength of partnership among stakeholders and non-stakeholders towards the journey of facilitating good governance. Good governance emphasizes the partnership between the stakeholders and non-stakeholders for the common good, specifically addressing how mechanisms, processes and facilitate the different stakeholders to articulate their interests; exercise their legal rights; meet their responsibilities; and mediate their differences. The suggestion from framework only applies to partnerships where no formal contractual arrangements are in place. Contracts should be managed in accordance with the contract procedure rules.

3.2 Perceived Agreements – The approach which requires any activity for selection of ceratin aspects of the setting which may be relevant to the action and also, dribbling another factors which may be irrelevant to the actions. Hence, when working in the direction of the goal, a person may skip some information that is not supportive to the plan.

C. Mediators –The strategy is to mediate among the potential stakeholders for a common interest. Once the strategies are clearer, discussions of options for a fair and effective process can be productive. With help of certain mediators the strategized dominant causes within the framework of partnership leads to an agreement so that all stakeholders' interests are met. Always, it makes the process more transparent and more consistent with the norm that the process belongs to the stakeholders. The Constructs are (1) Social Capital (2) Cultural Diversity (3) Socio-Economic Growth (4) Community Integration (5) Common Vision

1. Social Capital – As per the study's theoretical framework, social capital can be understood as a public good or resource that people produce by engaging civically, as a measure of their engagement, or as a precondition of active citizenship. In any case, it means the strength, distribution, and quality of relationships among the various stakeholders (Putnam, 1995) . Putnam defines social capital : Whereas physical capital refers to physical objects and human capital refers to properties of individuals [such as their own skills], social capital refers to connections among individuals—social networks and the norms of reciprocity and trustworthiness that arise from them. In that sense social capital is closely related to what some have called 'civic virtue.' The difference is that 'social capital' calls attention to the fact that civic virtue is most powerful when embedded in a dense network of reciprocal social relations."

2. Cultural Diversity - The definition of culture has long been a controversy and the term is used in a variety of ways. One commonly used definition is: "Culture" is that complex whole which includes knowledge, beliefs, arts, morals, laws, customs, and any other capabilities and habits acquired by various stakeholders as a member of society. This

diversity is embodied in the uniqueness and plurality of the identities of the groups and societies making up humankind. As a source of exchange, innovation and creativity, cultural diversity is as necessary for humankind as biodiversity is for nature. In this sense, Cultural diversity is the common heritage of humanity and should be recognized and affirmed for the benefit of stakeholders and non stakeholders as a factor in development. Cultural diversity widens the range of options open to everyone; it is one of the roots of development, understood not simply in terms of economic growth, but also as a means to achieve a more satisfactory intellectual, emotional, moral and spiritual existence .

3. Socio-Economic Growth - The concept of social economy is a complex one, with implications and ties into an important number of areas of the society (Cace et al, 2011). For the emerging sector of social economy, partnerships of stakeholders with non stakeholders could represent an important boost due to the lack of resources the social economy entities are facing. Moreover, taking part in stakeholder's partnerships, the social economy entities would certainly increase their socialization pool, making themselves better known by the community and other public and private actors, maximizing their chances of further collaborations.

4. Community Integration – It is differently described in form of enveloping the whole participation of everyone for community. For the purposes of this plan community is defined as any stakeholders who live and/or work within the local area of the proposed activity. This includes political representatives, statutory bodies, businesses, community groups, resident associations, education and training providers and employment initiatives. The community engagement plan must be designed by the non-stakeholders or local team to ensure and follow a controlled, well managed and visible set of processes

aimed at achieving well-formed outcomes and desired results. All tasks and activities will be undertaken within a structured accountability framework based on continuous improvement and development.

5. Common Vision – For a successful partnership, various aspects include, accuracy among each stakeholder, their aims and objectives along with the objectives laid down in the partnership agreement. There must be very clear communication process and rights to making the decisions for all the partners involved in the partnering.

D. Benefits to Stakeholders and Non-Stakeholders - Partnerships are collaborative, long-term relationships between stakeholders and non-stakeholders. Partnerships can comprise large, medium or small business, teamed with large, medium or small section of stakeholders. They are innovative and flexible ways to bring mutual benefits to both partners. Partnerships are relationships that provide opportunities for mutual benefit and results beyond what any single stakeholder or sector could realize alone. The beneficiaries are (1) Stakeholders (2) Non-Stakeholders

   1. Stakeholders – Stakeholders are the ones who look forward to enhance value with collaboration towards creating a common goal for a common purpose. To achieve the potential benefits of partnership, organizations must be prepared to build, sustain, and evaluate them in a thoughtful way.

   2. Non – Stakeholders – With context of non stakeholders partnering with stakeholders it means growing the network which helps in increasing chances of encountering positive opportunities through the partnership relationships that is developed.

CHAPTER 7 –CONCLUSION

7.0 CONCLUSION

The researcher commenced the study with foremost understanding and identification of the research problem within the area of small hydro power industry in Uttrakhand. The growth of small hydro power helps in boosting the development of economy and social aspects in the present and future scenario.Each five year plan has a target but achievements show dismal picture. Various projects which are on the way, but the deficient manpower for execution of small hydro power projects for operational zing and maintaining the manpower is already being acknowledged. Delay is eventually leading to cost overruns. Hence, forwarding towards the "What are the considerations for partnering of primary stakeholder with non-stakeholder in a mutual benefit scenario". This study processed with addressing some of the key human resource challenges in the small hydro power sector today. Firstly identification of the significant skill gaps during the construction phase and lay down strategies to attract new talent, and retaining the appropriate manpower to create the required infrastructure for development of manpower as a measure of social inclusion at the plant site. The study has suggested probable answer to the research problem discussed. In order to capture support from the local population and reduce the problem of skill gap during the construction stage of small hydro power, appropriate measures were identified. Hence, constituting towards reviewing the various considerations for partnering of primary stakeholder (organization involved during construction of the small hydro power project) with non-stakeholder (members of community residing nearby the small hydro power project site) in a mutual benefit scenario. In order to achieve a successful partnership, establishing alliance at every step of partnership. Partnership can only be successful if the members involved in the partnership setup value the collaboration and together works towards enhancing it. From a stakeholder's development perspective, it is important to determine the effectiveness of partnership and the contribution towards the empowerment of involved stakeholders for social and economic change.

7.1LIMITATIONS OF THE STUDY

Owing to time and resource constraints, comprehensive socio-economic impacts of Small hydro power have not been dealt with in detail. Further, although an attempt was made to capture complete sample data sets in both villages, because of the coincidence with monsoon season, a certain degree of bias may be observed in the sampling method. However, it should be noted that the results of this study involve many data sources, and therefore the potential bias from the survey would be balanced out by the trends seen in secondary sources of data. The study has noted this wherever applicable throughout the report. *Limitations of this study include:*

1. The Study was conducted in a small district region of Rudraprayag in Uttrakhand. This region has only two small power plants in construction stage. The project area including the stream basin is very sparely populated and the literacy level is low. This may be perceived as a barrier and possibly resulted in the smaller number of participants.

2. The field area of the study was located in remote hilly regions of Uttrakhand. Here, the region is mainly male dominated owing to the gender differences which could not be the focus of the study.

3. Responses of the respondents are mostly proposals for future. Indifference attitude of direct stakeholders, since they are associated with organization which is a government entity, they feel critical thinking is part policy making being the responsibility of government.

4. Construction of a small hydro power plant is very technical in nature. Effective and efficient construction is result of proper planning at various fronts done by stakeholders involved in the process. It was observed that the technical inefficiencies were criticized, thus forming an ignorant attitude of respondents towards non technical barriers.

7.2 FURTHER SCOPE OF STUDY

Construction of hydro power is usually done in remote sites area. There is further scope for understanding various measures of social inclusion for hydro power sector in other states and,

Further analysis can be done to understand the effectiveness of each measure undertaken. Continuing research on the same grounds, studies can be carried out for skill Generation Program at regional level.

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Appendix 1: List of small hydro power plants in Uttrakhand

Projects Under Construction					
S.N.	**Name of Project**	**Installed Capacity (MW)**	**Name of stream/River**	**Name of District**	**Expected Year of commissioning**
1	Dunao	1.5	Eastern Nayar	Pauri	2015-16
2	Suwarigad	2	Bhagirathi	Uttarkashi	2017-18
3	Limchagad	3.5	Bhagirathi	Uttarkashi	2017-18
4	Asiganga-I	4.5	Asiganga	Uttarkashi	2017-18
5	Asiganga-II	4.5	Asiganga	Uttarkashi	2017-18
6	Suringad-II	5	Suringad	Pithoragarh	2017-18
7	Kaliganga-I	4	Kaliganga	Rudrprayag	2017-18
8	Madhmaheshwar	15	Madhmaheshwar	Rudrprayag	2018-19
9	Kaldigad	9	Kaldigad	Uttarkashi	2018-19
10	Kaliganga-II	4.5	Kaliganga	Rudrprayag	2018-19
	Total	**53.5**	**MW**		

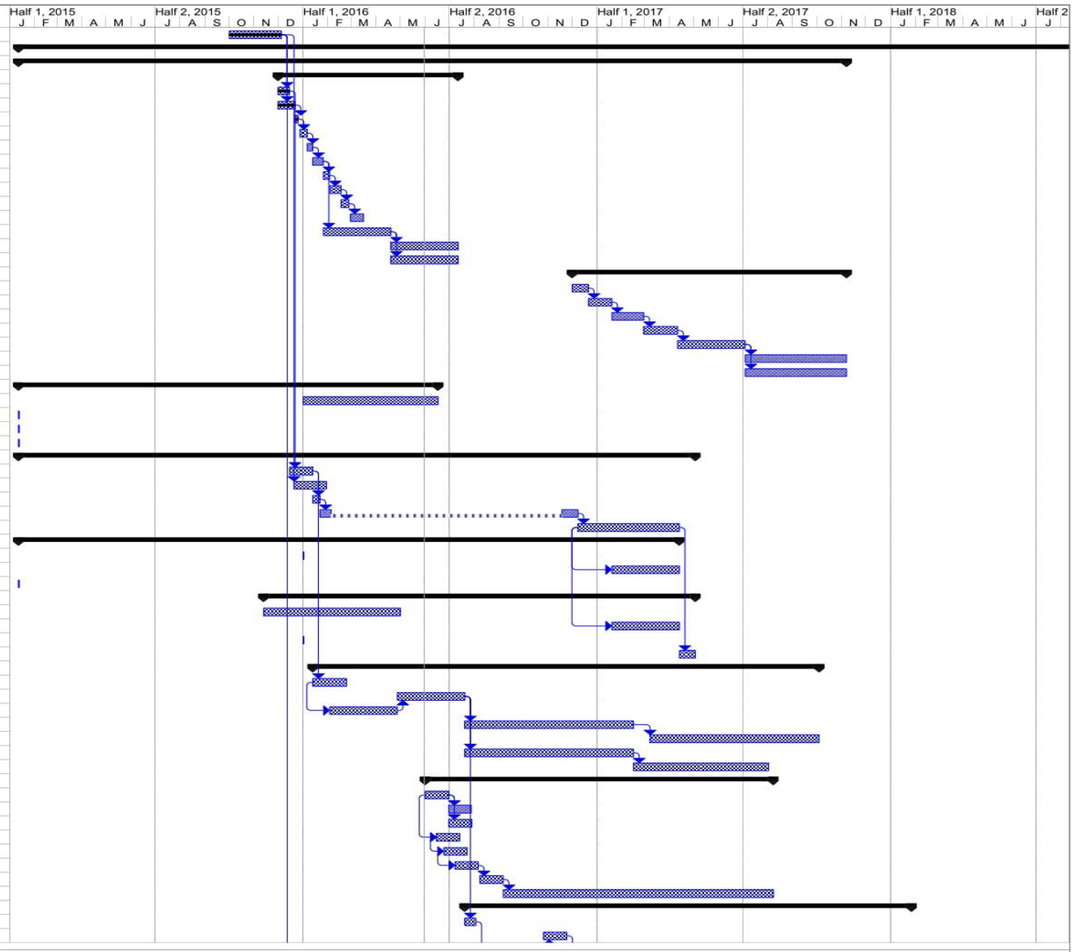
UJVNL- Small Hydro Power Projects

Projects Under Operation

S.N.	**Name of Project**	**Installed Capacity (MW)**	**Name of stream/River**	**Name of District**	**Year of commissioning**
1	Pathari	20.4	Upper ganga Canal	Hardwar	1955
2	Mohmadpur	9.3	Upper ganga Canal	Hardwar	1952
3	Galogi	3	Bhattafall	Dehradun	1907
4	Urgam	3	Kalpganga	Chamoli	1998
5	Pilangad	2.25	Pilangad	Uttarkashi	2004
	Total	**37.95**	**MW**		

Appendix 2: Construction schedule of a Small Hydro Power Plant

ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	Mobilization	47 days?	Thu 01-10-15	Fri 04-12-15		
2	**Head works**	**1199 days?**	**Mon 12-01-15**	**Tue 13-08-19**		
3	**Construction of Wier (121 m)**	**736 days?**	**Mon 12-01-15**	**Mon 06-11-17**		
4	**Phase-I**	**160 days?**	**Tue 01-12-15**	**Mon 11-07-16**		
5	River diversion	14 days?	Tue 01-12-15	Mon 14-12-15	1	
6	Slip clearance (23500(Weir)+2600(FT))=32830)	21 days	Tue 01-12-15	Mon 21-12-15	1	
7	Excavation between ch. o to 15 m length	4 days	Tue 22-12-15	Fri 25-12-15	6	
8	Base Concrete PCC M10/M15	7 days	Mon 28-12-15	Tue 05-01-16	7	
9	Excavation between ch. 15 to 30 m length	5 days	Wed 06-01-16	Tue 12-01-16	8	
10	Base Concrete PCC M10/M15	9 days	Wed 13-01-16	Mon 25-01-16	9	
11	Excavation between ch. 30 to 45 m length	6 days	Tue 26-01-16	Tue 02-02-16	10	
12	Base Concrete PCC M10/M15	10 days?	Wed 03-02-16	Tue 16-02-16	11	
13	Excavation between ch. 45 to 60 m length	8 days	Wed 17-02-16	Fri 26-02-16	12	
14	Base Concrete PCC M10/M15	12 days	Mon 29-02-16	Tue 15-03-16	13	
15	M20 sub-structure/super structure/Plum Concrete	60 days	Tue 26-01-16	Mon 18-04-16	10	
16	Construction of pier	60 days?	Tue 19-04-16	Mon 11-07-16	15	
17	Construction of Under sluice (12 M)	60 days?	Tue 19-04-16	Mon 11-07-16	15	
18	**Phase-II**	**243 days?**	**Thu 01-12-16**	**Mon 06-11-17**		
19	River diversion	14 days?	Thu 01-12-16	Tue 20-12-16		
20	Slip clearance (20000)	21 days?	Wed 21-12-16	Wed 18-01-17	19	
21	Excavation	28 days?	Thu 19-01-17	Mon 27-02-17	20	
22	Base Concrete PCC M10/M15	30 days?	Tue 28-02-17	Mon 10-04-17	21	
23	M20 sub-structure/super structure/Plum Concrete	60 days?	Tue 11-04-17	Mon 03-07-17	22	
24	Construction of balance work of Pier	90 days?	Tue 04-07-17	Mon 06-11-17	23	
25	Construction of balance work of Under sluice	90 days?	Tue 04-07-17	Mon 06-11-17	23	
26	**Weir Gate (5 m (W) x 6 m (H)**	**374 days?**	**Mon 12-01-15**	**Thu 16-06-16**		
27	Fabrication of Gates	120 days?	Fri 01-01-16	Thu 16-06-16		
28	Installation of bed embedments	1 day?	Mon 12-01-15	Mon 12-01-15		
29	Supply of Hoisting Arrangement	1 day?	Mon 12-01-15	Mon 12-01-15		
30	Installation of Gate	1 day?	Mon 12-01-15	Mon 12-01-15		
31	**Construction of Intake**	**602 days?**	**Mon 12-01-15**	**Tue 02-05-17**		
32	Slip clearance	21 days	Tue 15-12-15	Tue 12-01-16	5	
33	Protection work (R.R. Masonary)	30 days	Mon 21-12-15	Fri 29-01-16	1FS+10 days	
34	Excavation	7 days	Wed 13-01-16	Thu 21-01-16	32	
35	Base Concrete PCC M10/M15	24 days	Fri 22-01-16	Wed 07-12-16	34	
36	M20 sub-structure/super structure/Plum Concrete	90 days	Thu 08-12-16	Wed 12-04-17	35	
37	**Trash Rack**	**588 days?**	**Mon 12-01-15**	**Wed 12-04-17**		
38	Fabrication of Trash Rack	1 day?	Fri 01-01-16	Fri 01-01-16		
39	Installation of bed embedments	60 days?	Thu 19-01-17	Wed 12-04-17	36SS+30 day	
40	Installation of Trash Rack	1 day?	Mon 12-01-15	Mon 12-01-15		
41	**Intake Gate**	**383 days?**	**Fri 13-11-15**	**Tue 02-05-17**		
42	Fabrication of Gates	121 days?	Fri 13-11-15	Sat 30-04-16		
43	Installation of bed embedments	60 days	Thu 19-01-17	Wed 12-04-17	36SS+30 day	
44	Supply of Hoisting Arrangement	1 day?	Fri 01-01-16	Fri 01-01-16		
45	Installation of Gate	14 days	Thu 13-04-17	Tue 02-05-17	36	
46	**Construction of Power Duct**	**450 days?**	**Wed 13-01-16**	**Tue 03-10-17**		
47	Slip clearance	30 days?	Wed 13-01-16	Tue 23-02-16	32	
48	Excavation	60 days?	Wed 27-04-16	Tue 19-07-16	49	
49	RR Masonary (Protection Work)	60 days?	Wed 03-02-16	Tue 26-04-16	47SS+15 day	
50	Base Concrete	150 days?	Wed 20-07-16	Tue 14-02-17	48	
51	Concreting	150 days?	Wed 08-03-17	Tue 03-10-17	50FS+15 day	
52	Construction of Super passage	150 days?	Wed 20-07-16	Tue 14-02-17	48	
53	Laying RCC Slab	120 days?	Wed 15-02-17	Tue 01-08-17	52	
54	**Construction of Feeder Tunnel**	**309 days?**	**Wed 01-06-16**	**Mon 07-08-17**		
55	Removing of filled up silt	21 days	Wed 01-06-16	Wed 29-06-16		
56	Removing of under cuts etc	20 days?	Thu 30-06-16	Wed 27-07-16	55	
57	Construction of Portal at Inlet	21 days?	Thu 30-06-16	Thu 28-07-16	55	
58	Rock bolts & Shotcreting	21 days?	Wed 15-06-16	Wed 13-07-16	55SS+10 day	
59	Rib erection	21 days?	Fri 24-06-16	Fri 22-07-16	58SS+7 days	
60	Back fill concreting	21 days?	Fri 08-07-16	Fri 05-08-16	59SS+10 day	
61	Flooring (RCC)	21 days?	Mon 08-08-16	Mon 05-09-16	60	
62	Lining (RCC)	240 days?	Tue 06-09-16	Mon 07-08-17	61	
63	**De-silting tank**	**398 days?**	**Wed 20-07-16**	**Fri 26-01-18**		
64	Slip clearance	10 days?	Wed 20-07-16	Tue 02-08-16	48	
65	Excavation	21 days	Wed 26-10-16	Wed 23-11-16	66	



Project: Construction Schedule_MM_2
Date: Tue 31-05-16

Task	Project Summary	Inactive Milestone	Duration-only	Finish-only	Deadline
Split	External Tasks	Inactive Milestone	Manual Summary Rollup	External Tasks	
Milestone	External Milestone	Inactive Summary	Manual Summary	External Milestone	
Summary	Inactive Task	Manual Task	Start-only	Progress	

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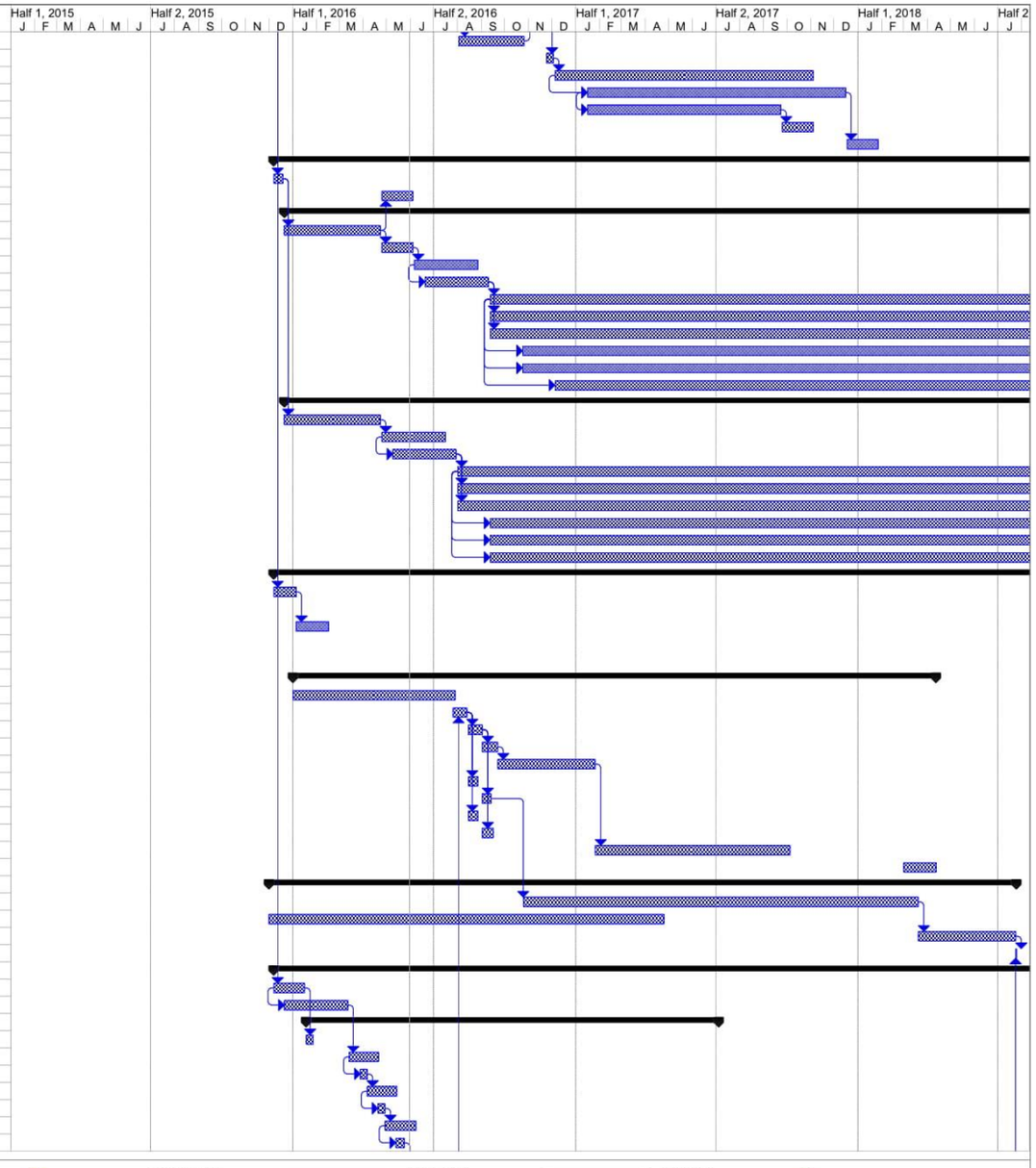
ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
66	Protection work (RR Masonary)	60 days?	Wed 03-08-16	Tue 25-10-16	64	
67	Base Concrete	7 days?	Thu 24-11-16	Fri 02-12-16	65	
68	Concrete	240 days?	Mon 05-12-16	Fri 03-11-17	67	
69	Installation of Flushing conduit pipe/Jali (450/750 mm dia)	240 days?	Mon 16-01-17	Fri 15-12-17	68SS+30 day	
70	Supply of Flushing Conduit Valves	180 days?	Mon 16-01-17	Fri 22-09-17	69SS	
71	Installation of flushing valves	30 days?	Mon 25-09-17	Fri 03-11-17	70	
72	Installation of Jali on top of De-silting Tank	30 days?	Mon 18-12-17	Fri 26-01-18	69	
73	**Construction of Tunnel**	**964 days?**	**Mon 07-12-15**	**Tue 13-08-19**		
74	Making Approach for adit	10 days?	Mon 07-12-15	Fri 18-12-15	1	
75	Construction of Portal	30 days?	Mon 25-04-16	Fri 03-06-16	77	
76	**Construction of Tunnel (Face-I)(1300 M)**	**900 days?**	**Mon 21-12-15**	**Wed 29-05-19**		
77	Silt cleaning	90 days?	Mon 21-12-15	Fri 22-04-16	74	
78	Installation of ventilation duct	30 days?	Mon 25-04-16	Fri 03-06-16	77	
79	Removing of under cuts etc	60 days?	Mon 06-06-16	Fri 26-08-16	78	
80	Rock bolts & Shotcreting (1050)	60 days?	Mon 20-06-16	Fri 09-09-16	79SS+10 day	
81	Excavation in meters	650 days?	Mon 12-09-16	Wed 06-03-19	80	
82	Rock bolting & Rib erection	650 days?	Mon 12-09-16	Wed 06-03-19	80	
83	Shotcreting	650 days?	Mon 12-09-16	Wed 06-03-19	80	
84		650 days?	Mon 24-10-16	Wed 17-04-19	81SS+30 day	
85	Back Filling	650 days?	Mon 24-10-16	Wed 17-04-19	81SS+30 day	
86	Lining	650 days?	Mon 05-12-16	Wed 29-05-19	81SS+60 day	
87	**Construction of Tunnel (Face-II)(1421 M)**	**890 days?**	**Mon 21-12-15**	**Wed 15-05-19**		
88	Silt cleaning	90 days?	Mon 21-12-15	Fri 22-04-16	74	
89	Removing of under cuts etc	60 days?	Mon 25-04-16	Fri 15-07-16	88	
90	Rock bolts & Shotcreting (1050)	60 days?	Mon 09-05-16	Fri 29-07-16	89SS+10 day	
91	Excavation in meters	700 days?	Mon 01-08-16	Wed 03-04-19	90	
92	Rock bolting & Rib erection	700 days?	Mon 01-08-16	Wed 03-04-19	90	
93	Shotcreting	700 days?	Mon 01-08-16	Wed 03-04-19	90	
94	Back Filling	700 days?	Mon 12-09-16	Wed 15-05-19	91SS+30 day	
95	Flooring (RCC)	700 days?	Mon 12-09-16	Wed 15-05-19	91SS+30 day	
96	Lining	700 days?	Mon 12-09-16	Wed 15-05-19	91SS+30 day	
97	**Construction of Power Channel (21 m)**	**964 days?**	**Mon 07-12-15**	**Tue 13-08-19**		
98	Slip clearance	21 days?	Mon 07-12-15	Mon 04-01-16	1	
99	Excavation	14 days?	Thu 30-05-19	Tue 18-06-19	86	
100	RR Masonary (Protection Work)	30 days?	Tue 05-01-16	Mon 15-02-16	98	
101	Base Concrete	10 days?	Wed 19-06-19	Tue 02-07-19	99	
102	Concreting	30 days?	Wed 03-07-19	Tue 13-08-19	101	
103	**Construction of Forebay**	**594 days?**	**Fri 01-01-16**	**Wed 11-04-18**		
104	Protection work	150 days?	Fri 01-01-16	Thu 28-07-16		
105	Excavation	14 days?	Tue 26-07-16	Fri 12-08-16	133	
106	Base Concrete (M10)	14 days?	Mon 15-08-16	Thu 01-09-16	105	
107	Sub-Structure (RCC)	14 days?	Fri 02-09-16	Wed 21-09-16	106	
108	Super-Structure	90 days?	Thu 22-09-16	Wed 25-01-17	107	
109	Fabrication of Bell Mouth	10 days?	Mon 15-08-16	Fri 26-08-16	105	
110	Erection of Bell Mouth	7 days?	Fri 02-09-16	Mon 12-09-16	106	
111	Supply of Valve	10 days?	Mon 15-08-16	Fri 26-08-16	105	
112	Erection of Valve	10 days?	Fri 02-09-16	Thu 15-09-16	106	
113	Construction of escape Channel	180 days?	Thu 26-01-17	Wed 04-10-17	108	
114	Construction of Jali	30 days?	Thu 01-03-18	Wed 11-04-18		
115	**Penstock (1700 mm dia, 500 m)**	**691 days?**	**Tue 01-12-15**	**Tue 24-07-18**		
116	laying of main penstock(in r.m)	365 days?	Tue 25-10-16	Mon 19-03-18	110FS+30 da	
117	Construction of anchor/saddle block	365 days?	Tue 01-12-15	Mon 24-04-17		
118	Erection of trifercation	90 days?	Tue 20-03-18	Mon 23-07-18	116	
119	Erection of penstock (r.m)	1 day?	Tue 24-07-18	Tue 24-07-18	118,143FS+1	
120	**Construction of Power House**	**760 days?**	**Mon 07-12-15**	**Fri 02-11-18**		
121	Making Approach road	30 days?	Mon 07-12-15	Fri 15-01-16	1	
122	Protection works	60 days?	Mon 21-12-15	Fri 11-03-16	121SS+10 da	
123	**Construction of Protection wall (200 m)**	**382 days?**	**Mon 18-01-16**	**Tue 04-07-17**		
124	Excavation of Block No-1 (30 m)	7 days?	Mon 18-01-16	Tue 26-01-16	121	
125	Concreting	28 days?	Mon 14-03-16	Wed 20-04-16	122	
126	Excavation of Block No-2 (30 m)	7 days?	Mon 28-03-16	Tue 05-04-16	125SS+10 da	
127	Concreting	28 days?	Wed 06-04-16	Fri 13-05-16	126	
128	Excavation of Block No-3 (30 m)	7 days?	Wed 20-04-16	Thu 28-04-16	127SS+10 da	
129	Concreting	28 days?	Fri 29-04-16	Tue 07-06-16	128	
130	Excavation of Block No-4 (30 m)	7 days?	Fri 13-05-16	Mon 23-05-16	129SS+10 da	



Project: Construction Schedule_MM_2
Date: Tue 31-05-16

Task | Project Summary | Inactive Milestone | Duration-only | Finish-only | Deadline
Split | External Tasks | Inactive Milestone | Manual Summary Rollup | External Tasks
Milestone | External Milestone | Inactive Summary | Manual Summary | External Milestone
Summary | Inactive Task | Manual Task | Start-only | Progress

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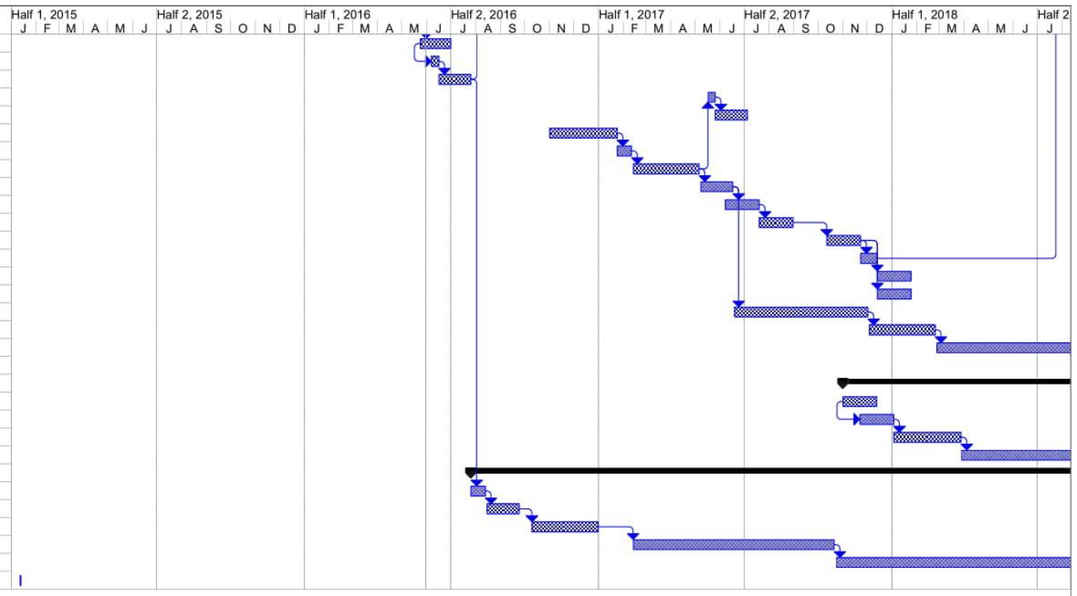
ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
131	Concreting	28 days?	Tue 24-05-16	Thu 30-06-16	130	
132	Excavation of Block No-5 (30 m)	7 days?	Tue 07-06-16	Wed 15-06-16	131SS+10 da	
133	Concreting	28 days?	Thu 16-06-16	Mon 25-07-16	132	
134	Excavation of Block No-6 (30 m)	7 days?	Wed 17-05-17	Thu 25-05-17	138FS+7 day	
135	Concreting	28 days?	Fri 26-05-17	Tue 04-07-17	134	
136	Excavation of Power House Pit	60 days?	Tue 01-11-16	Mon 23-01-17		
137	Laying of Earth mat	14 days?	Tue 24-01-17	Fri 10-02-17	136	
138	Laying of Raft foundation	60 days?	Mon 13-02-17	Fri 05-05-17	137	
139	Erection of Columns of Power House	30 days?	Mon 08-05-17	Fri 16-06-17	138	
140	Erection of EOT crane	30 days?	Thu 08-06-17	Wed 19-07-17	139FS-7 days	
141	Erection of Draft Tube	30 days?	Thu 20-07-17	Wed 30-08-17	140	
142	Erection of Spiral casing	30 days?	Thu 12-10-17	Wed 22-11-17	141FS+30 da	
143	Erection of MIV	15 days?	Thu 23-11-17	Wed 13-12-17	142	
144	Supply and erection of Turbine	30 days?	Thu 14-12-17	Wed 24-01-18	142FS+15 da	
145	Supply and erection of Generator	30 days?	Thu 14-12-17	Wed 24-01-18	142FS+15 da	
146	Roofing	120 days?	Mon 19-06-17	Fri 01-12-17	139	
147	Flooring	60 days?	Mon 04-12-17	Fri 23-02-18	146	
148	Supply and erection of Panels	120 days?	Mon 26-02-18	Fri 10-08-18	147	
149	Supply and erection of Transformer	60 days?	Mon 13-08-18	Fri 02-11-18	148	
150	**Construction of Tail Race Channel**	**225 days?**	**Wed 01-11-17**	**Tue 11-09-18**		
151	Excavation	30 days?	Wed 01-11-17	Tue 12-12-17		
152	Base concrete	30 days?	Wed 22-11-17	Tue 02-01-18	151SS+15 da	
153	laying of CC Blocks	60 days?	Wed 03-01-18	Tue 27-03-18	152	
154	Construction of RCC wall	120 days?	Wed 28-03-18	Tue 11-09-18	153	
155	**Construction of Switchyard**	**722 days?**	**Tue 26-07-16**	**Mon 29-04-19**		
156	levelling and dressing of area	14 days?	Tue 26-07-16	Fri 12-08-16	133	
157	laying earth mat	30 days?	Mon 15-08-16	Fri 23-09-16	156	
158	construction of Tower Foundation	60 days?	Mon 10-10-16	Fri 30-12-16	157FS+10 da	
159	Erection of towers	180 days	Mon 13-02-17	Fri 20-10-17	158FS+30 da	
160	laying/stretching of conductors	398 days	Mon 23-10-17	Mon 29-04-19	159	
161	Commissioning of the Project	1 day?	Mon 12-01-15	Mon 12-01-15		



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Milestone	External Milestone	Inactive Summary	Manual Summary	External Milestone	
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Appendix 3: Activity wise - List of Trades Required during construction stage of small hydro power plant

S. No.	Task Name	List of Trades Required
A.	**Mobilization**	
	Head works	All employees transit to construction site
	Construction of Wier (121 m)	
B.	**Phase-I**	
	River diversion	Sheet Metal Worker, Mason, Electrician, Power Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction Machinery Mechanic cum Operator, Draughtsmen (civil), Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer
	Slip clearance (23500(Weir)+2600(FT))=32830)	
	Excavation between ch. o to 15 m length	
	Base Concrete PCC M10/M15	
	Excavation between ch. 15 to 30 m length	
	Base Concrete PCC M10/M15	
	Excavation between ch. 30 to 45 m length	
	Base Concrete PCC M10/M15	
	Excavation between ch. 45 to 60 m length	
	Base Concrete PCC M10/M15	
	M20 sub-structure/super structure/Plum Concrete	
	Construction of pier	
	Construction of Under sluice (12 M)	
C.	**Phase-II**	
	River diversion	Sheet Metal Worker, Mason, Electrician, Power Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction Machinery Mechanic cum Operator, Draughtsmen (civil), Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer
	Slip clearance (20000)	
	Excavation	
	Base Concrete PCC M10/M15	
	M20 sub-structure/super structure/Plum Concrete	
	Construction of balance work of Pier	
	Construction of balance work of Under sluice	
D.	**Weir Gate (5 m (W) x 6 m (H)**	
	Fabrication of Gates	Painter, Sheet Metal Worker, Welder, Gas Cutter, Tool & Die Maker, Fitter, Turner, Mechanist, Mechanist (grinder)
	Installation of bed embedments	
	Supply of Hoisting Arrangement	
	Installation of Gate	
E.	**Construction of Intake**	
	Slip clearance	Sheet Metal Worker, Mason, Electrician, Power Electrician,

Protection work (R.R. Masonary)	Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction Machinery Mechanic cum Operator, Draughtsmen (civil), Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer
Excavation	
Base Concrete PCC M10/M15	
M20 sub-structure/super structure/Plum Concrete	

F.

Trash Rack	
Fabrication of Trash Rack	Painter, Sheet Metal Worker, Welder, Gas Cutter, Tool & Die Maker, Fitter, Turner, Mechanist, Mechanist (grinder)
Installation of bed embedments	
Installation of Trash Rack	

G.

Intake Gate	
Fabrication of Gates	Painter, Sheet Metal Worker, Welder, Gas Cutter, Tool & Die Maker, Fitter, Turner, Mechanist, Mechanist (grinder)
Installation of bed embedments	
Supply of Hoisting Arrangement	
Installation of Gate	

H.

Construction of Power Duct	
Slip clearance	Sheet Metal Worker, Mason, Electrician, Power Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction Machinery Mechanic cum Operator, Draughtsmen (civil), Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer, Welder (Pipes & Pressure Vessels)
Excavation	
RR Masonary (Protection Work)	
Base Concrete	
Concreting	
Construction of Super passage	
Laying RCC Slab	

I.

Construction of Feeder Tunnel	
Removing of filled up silt	Sheet Metal Worker, Mason, Electrician, Power Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction Machinery Mechanic cum Operator, Draughtsmen (civil), Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer, Welder (Pipes & Pressure Vessels), Lineman, Wireman, Painter, Gas Cutter, Mechanic (Repair & Menatinance of Heavy Vehicles)
Removing of under cuts etc	
Construction of Portal at Inlet	
Rock bolts & Shotcreting	
Rib erection	
Back fill concreting	
Flooring (RCC)	
Lining (RCC)	

J.

De-silting tank	
Slip clearance	Sheet Metal Worker, Mason, Electrician, Power Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction Machinery Mechanic cum Operator, Draughtsmen (civil),
Excavation	
Protection work (RR Masonary)	
Base Concrete	

Concrete	Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer
Installation of Flushing conduit pipe/Jali (450/750 mm dia)	
Supply of Flushing Conduit Valves	
Installation of flushing valves	
Installation of Jali on top of De-silting Tank	

K.

Construction of Tunnel	
Making Approach for adit	Sheet Metal Worker, Mason, Electrician, Power Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction Machinery Mechanic cum Operator, Draughtsmen (civil), Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer, Welder (Pipes & Pressure Vessels), Lineman, Wireman, Painter, Gas Cutter, Mechanic (Repair & Menatinance of Heavy Vehicles)
Construction of Portal	
Construction of Tunnel (Face-I)(1300 M)	
Silt cleaning	
Installation of ventilation duct	
Removing of under cuts etc	
Rock bolts & Shotcreting (1050)	
Excavation in meters	
Rock bolting & Rib erection	
Shotcreting	
Back Filling	
Lining	
Construction of Tunnel (Face-II)(1421 M)	
Silt cleaning	
Removing of under cuts etc	
Rock bolts & Shotcreting (1050)	
Excavation in meters	
Rock bolting & Rib erection	
Shotcreting	
Back Filling	
Flooring (RCC)	
Lining	
Construction of Power Channel (21 m)	
Slip clearance	
Excavation	
RR Masonary (Protection Work)	
Base Concrete	
Concreting	

L.

Construction of Forebay	
Protection work	Sheet Metal Worker, Mason, Electrician, Power Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction
Excavation	
Base Concrete (M10)	

Sub-Structure (RCC)	Machinery Mechanic cum Operator, Draughtsmen (civil), Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer
Super-Structure	
Fabrication of Bell Mouth	
Erection of Bell Mouth	
Supply of Valve	
Erection of Valve	
Construction of escape Channel	
Construction of Jali	

M.

Penstock (1700 mm dia, 500 m)	
laying of main penstock(in r.m)	Lineman, Wireman, Plumber, Painter, Driver cum Fitter, Foundaryman, Sheet Metal Worker, Welder, Mason, Gascutter, Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist (Grinder), Mechanic (Motor Vehicle), Draughtsmen (Civil), Draughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Welder (Pipes & Pressure Vessels)
Construction of anchor/saddle block	
Erection of trifercation	
Erection of penstock (r.m)	

N.

Construction of Power House	
Making Approach road	Lineman, Wireman, Furniture & Cabinate maker, Plumber, Painter, Driver cum Fitter, Foundaryman, Carpenter, SheetMetal Worker, Welder, Mason, Auto mechanic, Gascutter, Electritian, Tool & Die maker, Power Electrician, Operator cum Mechanic (power plant), Mechanic Machine & Tool Mantinance, Fitter, Turner, Machinist, Machanist(grinder), Information Technology & Electronic System Maintenance, Mechanic (Motor Vehicle), Refrigerator & Air Conditioning Mechanic, Construction Machinery & Mechanic Operator, Drughtsmen (Civil), Drughtsmen (Mechanical), Surveyor, Fitter Structural, Line Operator, Winder (Armature), Lift Mechanic, Crane Operator (overhead steel industry), Mechanic Automobile , Welder (Pipes & Pressure Vessels), Operator PLC Systems, Computer networking technicians, Mechanic (Repair & Mentinance of Heavy Vehicles), Battery Repairer, HouseKeeper, Computer Opertaor & Programming Assistant, Secretarial Assistant, Stenographer
Protection works	
Construction of Protection wall (200 m)	
Excavation of Block No-1 (30 m)	
Concreting	
Excavation of Block No-2 (30 m)	
Concreting	
Excavation of Block No-3 (30 m)	
Concreting	
Excavation of Block No-4 (30 m)	
Concreting	
Excavation of Block No-5 (30 m)	
Concreting	
Excavation of Block No-6 (30 m)	
Concreting	
Excavation of Power House Pit	
Laying of Earth mat	
Laying of Raft foundation	
Erection of Columns of Power House	
Erection of EOT crane	
Erection of Draft Tube	
Erection of Spiral casing	
Erection of MIV	

Supply and erection of Turbine	
Supply and erection of Generator	
Roofing	
Flooring	
Supply and erection of Panels	
Supply and erection of Transformer	

O.

Construction of Tail Race Channel	
Excavation	Sheet Metal Worker, Mason, Electrician, Power Electrician, Mechanic Machine & Tool Maintenance, Fitter, Turner, Mechanist, Mechanic (Motor Vehicles), Construction Machinery Mechanic cum Operator, Draughtsmen (civil), Darughtsmen (Mechanical), Surveyor, Fitter Structural, Crane Operator, Housekeeper, Secretarial Assistant, Stenographer
Base concrete	
laying of CC Blocks	
Construction of RCC wall	

P.

Construction of Switchyard	
levelling and dressing of area	Lineman, Wireman, Plumber, Painter, Driver cum Fitter, Foundaryman, Carpenter, SheetMetal Worker, Welder, Mason, Gascutter, Electritian, Power Electrician, Mechanic Machine & Tool Mantinance, Fitter, Turner, Machinist, Information Technology & Electronic System Maintenance, Drughtsmen (Civil), Drughtsmen (Mechanical), Surveyor, Fitter Structural, Line Operator, Winder (Armature), Crane Operator (overhead steel industry), Operator PLC Systems, Computer networking technicians, Computer Opertaor & Programming Assistant, Secretarial Assistant, Stenographer
laying earth mat	
construction of Tower Foundation	
Erection of towers	
laying/stretching of conductors	

Q. **Commissioning of the Project**

Appendix4: Activites During Construction Phase

Activity – Skill Set Mapping

Activities Performed	Workeforce Hierarchy	Level	Skill Required	Skill Gap	Measures
Civil Works	Civil Engineer	Project Manager (of 3 to 4 years experience)	Ability to manage costs, quality and ensure on-time delivery of project	Insufficient orientation towards project costing, efficient inventory management and adhering to deadlines	Strengthening the industry-training system linkages
	Civil Designer		Ability to highlight issues, if any, to the senior management and ensure their resolution so as not to compromise on cost, quality and time	Poor project management and resource estimation skills	Developing certified training programs that help trainees 'earn while they learn'
	Quality Inspector		Sufficient knowledge of the local language to be able to communicate with contractors and labourers	Difficulty in controlling time overrun and cost overrun	Strengthening the teacher training framework
	Skilled Labor		Ability to maintain project site documents	Inadequate project management skills	Developing a trainer network
	Unskilled Labor		Basic understanding of hydraulics electrical knowledge and piping	Inadequate knowledge of planning and scheduling software	Developing a labor market information system that reflects the dynamic status of industry's manpower profile and needs
Hydro Mechanical	Mechanical Engineer		Ability to effectively manage contractors and ensure that contract specifications are being met	Lack of communication and team building skills	Developing industry responsive national occupational standards for developing standardized training curricula
	Mechanical Designer		Ability to understand technical drawings and thus the project design	Insufficient ability to manage multiple contractors and resolve conflicts	Identification of target manpower (e.g. rural population) sources to whom a career in engineering / capital goods sector is aspirational
	Quality Inspector		Ability to ensure compliance to construction approvals and laws and understand legal issues associated with the industry		Spread awareness
	Skilled Labor		Ability to articulate project objectives to team members, coordinate and motivate the site team		Shortlist priority areas
	Unskilled Labor		Advanced knowledge on project costing and project management tools like PERT and CPM – includes good computer skills		Emulate role-model institutions
	Project Manager		Ability to control the finances of the project, including expenditure monitoring and reporting		Design teachers' training programs
			Strong oral and written communication skills to be able to communicate effectively with Head Office, contractors, architects, laborers etc.		Build Trainers' network
Electro Mechanical Works	Electrical Engineer		Ability to ensure that safety and health norms are adhered to		
	Electrical Designer		Ability to plan and effectively deploy the available resources (man, machine, material)		
	Quality Inspector		Ability to manage inventory and ensure appropriate usage		
	Skilled Labor		Strong networking and liasoning skills		
	Unskilled Labor		Basic computer skills and ability to work on MS Excel		
			Strong task orientation, trouble shooting to resolve issues, high integrity and energy levels		
			Basic knowledge of construction equipment		
Transmission & Distribution Works	Electrical Engineer	Engineers / Supervisors	Ability to communicate and implement safe practices, such as ensuring that a net is laid while working in a pit with loose soil	Civil engineers hired for this role usually do not have sufficient ability to develop and comply to a Preventive Maintenance schedule	
	Electrical Designer		Ability to ensure minimal machine downtime and avoid breakdowns – say, for batching plants, transit mixers, etc.	Inadequate orientation to develop and adhere to safety norms at construction site	
	Quality Inspector		Ability to appropriately allocate work to semi-skilled and unskilled workmen	Lack of communication and team management skills	
	Skilled Labor		Ability to effectively communicate with semi-skilled and unskilled workmen and articulate project objectives to all	Incomplete knowledge of tendering processes	
	Unskilled Labor		Ability to understand and take instructions from project managers	Insufficient writing skills in English and documentation skills	
			Ability to supervise and ensure quality of work	Incomplete understanding of risks associated with a project such as time/cost over-runs as well as legal aspects	

	Ability to maintain a high level of integrity	Lack of coordination skills
	Ability to manage skilled and unskilled workmen and resolve disputes as and when they arise	Poor time management skills
	Ability to create a sense of trust among the semi-skilled and unskilled workmen so that they approach the engineer / supervisor in case of any issues	Poor planning and scheduling skills, including skills for estimating manpower and material
	Ability to understand, speak, and know the local language and also understand its nuances	Insufficient orientation towards project costing, functionality of equipment and their maintenance
	Knowledge of construction equipment and their functions and the ability to ensure that the equipment is maintained as per standards	Insufficient ability to resolve conflicts
	Good written and oral communication skills	Few students willingly take up Civil Engineering courses at the diploma and degree levels and it is thus difficult to fill up these seats with good students – many students who take up this course do so because they do not get admission to other preferred courses – hence the quality of students who pass out from the degree and diploma courses has room for improvement
	Understanding of legal issues associated with the industry	Engineers are required to be on-site – there is resistance to travelling and staying in remote locations
	Ability to manage conflicts and stress	Many do not know / understand the native language of skilled / unskilled workmen – need to be deputed on a project based on language skills
	Overall execution and management of theproject allotted	Inadequate planning skills
	Ability to schedule preventive maintenance activities and undertake breakdown maintenance	Inadequate practical industry exposure

Skilled workmen	Ability to coordinate with unskilled workmen	Inadequate knowledge of construction specific areas - such as lining, leveling, and finishing skills in carpentry
	Ability to operate key equipment such as cranes, especially tower crane operations, and also mechanisms for loading and unloading of cranes	Availability of these personnel is an issue - it may be necessary to import people with relevant skills from Middle East/South East Asian countries/ China, etc.
	Ability to work at heights (for high rise buildings, especially in the case of crane operators)	Lack of knowledge of basic machine operation – appropriate operation of cranes – lifting and placing
	Ability to deliver quality output	Inadequate ability to understand instructions of supervisors/engineers.
	Need to be adept in their own trades – e.g. plastering, painting, plumbing, etc.	
	Knowledge of construction specific areas – such as while carpentry is a generic course which is taught, there is a need for carpenters engaged in the Construction industry to be aware of lining, leveling, and finishing skills	
	Need to understand machine operations and basic machine troubleshooting	
	Ability to comply with safety and quality measures	
	Need to have basic knowledge of construction engineering	

Unskilled workmen	Ability to perform the operations of excavation, carrying, cutting, helping of mason, mixing, spreading of stones, packing	Very little safety orientation
	Ability to be involved in and perform manual labour intensive work – thus need to be medically fit	Inadequate workplace skills – discipline, cleanliness, etc.
	Need to have an orientation towards safety requirements and basic workplace practices (reporting to work on time, etc.)	Inability to follow simple instructions
	Need to be able to move material as required – using carts / manually, and thus also need to be physically strong	Low job loyalty - very prone to leaving one construction company and joining another
	Ability to take instructions from skilled workmen / supervisors / engineers and execute them appropriately	
	Material preparation / Concrete mixing	

Project conceptualisation, design, planning (including seeking approvals) - Experienced personnel	Ability to define the project theme and key features, narrow in on the target set of customers, understand/perceive their requirements, design the layout accordingly keeping in mind functionality, architectural and aesthetic aspects and frame the marketing and sales strategy	Inadequate ability to plan out large scale projects
	Ability to liaison with architects (in case architects are subcontracted by the company)	
	Ability to undertake the detailed design and engineering and shortlist and select vendors for borewells, earth filling, construction, development works, landscaping, rticulture, etc.	
	Ability to correctly estimate the module-wise/function-wise costs and hence correctly estimate the total project cost	
	Ability to estimate correct project timelines	

Appendix5:Questionnaire Civil Works

List of Activity wise skill sets of Skilled Laborers - Civil Works (only construction stage of Small Hydro Power Projects)					
Phase I - River diversion, Slip clearance, Excavation					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers - Civil Works (only construction stage of Small Hydro Power Projects)					
Phase II - River diversion, Slip clearance, Excavation, Base Concrete, Construction of balance work of Pier &Under sluice					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers - Civil Works (only construction stage of Small Hydro Power Projects)					
Construction of Power Duct					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers - Civil Works (only construction stage of Small Hydro Power Projects)					
Construction of Feeder Tunnel					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers - Civil Works (only construction stage of Small Hydro Power Projects)					
De-Silting Tank					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers - Civil Works (only construction stage of Small Hydro Power Projects)					
Construction of Tunnel					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers - Civil Works (only construction stage of Small Hydro Power Projects)					
1. Construction of Power Channel					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

Appendix6:Questionnaire Electro-Mechanical Works

List of Activity wise skill sets of Skilled Laborers –Electro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
1. Construction of Power House					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers –Electro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
2. Construction of Protection wall					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers –Electro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
3. Construction of Tail Race Channel					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers –Electro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
4. Construction of Switchyard					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

Appendix7:Questionnaire Hydro-Mechanical Works

List of Activity wise skill sets of Skilled Laborers – Hydro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
1. Weir Gate					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers – Hydro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
2. Construction of Intake					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers – Hydro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
3. Trash Rack - Fabrication					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers – Hydro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
4. Intake Gates - Installation of bed embedment's					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

List of Activity wise skill sets of Skilled Laborers – Hydro-Mechanical Works (only construction stage of Small Hydro Power Projects)					
5. Penstock					
Skill sets to identify Skill Gap	**5 (Very High Gap)**	**4 (High Gap)**	**3 (Neutral)**	**2 (less Gap)**	**1 (No Gap)**
Foundry man					
Sheet Metal Works					
Welding skills					
Masonry					
Power Electrician skills					
Fitter's Skills works					
Turner Skills works					
Crane Mechanical works					
Construction Machinery Mechanic cum Operational works					
Draughtsman (Civil) Skills works					
Surveyor's Skills					
Lineman Skills					
Carpenters Skills					
Gas Cutter					
Crane Operational works					
Draughtsman (Mechanical)					
Wireman Skills					
Crane Operating Skills					
Plumbing Skills					
Housekeeper					
Storekeeper					
Operating Skills PLC System					

Appendix8:CASE 1 – A detailed description Of Case

The Madhyamaheshwar Small Hydel Project is located on the river on the same name. The project is located in the Ukhimath tehsil of Rudraprayag district of Uttarakhand. It is proposed to have an installed capacity of 20000 KW with four (04) units of 5000 KW. The project has been conceived as a run of the river project without any storage.

The diversion weir is located in Mansuna village just after the confluence of a small tributary Kyar Gad and Madhyamaheshwar Ganga, which is 200 m downstream of the bridge near Buruwa village on the river on Madhyamaheshwar Ganga and the power house is located on left bank of the river just after its confluence with river Mandakini near village Chunni.

5.7.1 Project Purpose

The Madhyamaheshwar Ganga SHP has been proposed to be developed for augmenting the power generation in Uttarakhand especially using renewable energy source and for helping in rural electrification of the State. After commissioning of the Madhyamaheshwar Ganga Small Hydroelectric Project, the electrical energy produced shall be utilized for augmenting the energy supply in the local rural distribution network around Ukhimath, Guptakashi, Mansuna, Giriagaon etc. and higher reaches and may provide electricity to un-electrified villages of Kedarnath valley. The energy availability will also improve the voltage profile and reliability of the power system in this remote area in and around holy places like Madhyamaheshwar.

5.7.2 Water Resources

Madhyamaheshwar is a hilly stream and joins Mandakini at Ukhimath. Mandakini is a major tributary of river Alaknanda. Madhyamaheshwar is a perennial stream with a minimum flow of around 8.5 cumec. The stream has a catchment area of 429.67 sq.km extending from a height of about 5000 meter above MSL upto weir located at an elevation of 1236.0 m below the village Mansuna near Ukhimath. The stream has a snow catchment area of 49 sq.km and flows through a fairly good vegetated area comprising of Kedarnath Reserved Forest.

5.7.3 Power Plant

The power plant is proposed to have four (04) turbine – generating units each of 5000 KW output at generator terminals. The turbines shall operate under a net head of 175.45 meters. As for this head Francis turbines are suitable, the same has been proposed. The turbine-generator shall be of horizontal shaft type alignment. The generation voltage shall be at 3.3 kV which shall be stepped upto 33 kV through individual step-up transformers of 7200 kVA capacity each. Each of the generators shall be provided with brushless excitation system and all standard protections for generators and transformers of this capacity shall be provided.

5.7.4 Communication Facilities

The power station site is located at a distance of 4 km (by road) from Ukhimath. The diversion weir is located below the village Mansuna on Ukhimath - Madhyamaheswar shrine road. Power House is located near Ukhimath-Chunni-Kalimath motor road which is under construction by PWD. Approach to Power House site has to be constructed by UJVNL. Similarly a project road from the bridge on Jugasu – Pundar (Madhyamaheswar shrine) road is proposed to be constructed on the left bank of the river (due to easy accessibility) upto the weir site to facilitate its construction. The project is at a distance of 180 km from Rishikesh (the nearest railhead) on

National Highway No. 58/109. The metalled Rudraprayag- Kund – Ukhimath – Mansuna – Paunder road provides easy access from NH-58/109 from Rudra prayag upto the vicinity of the scheme.

5.7.5 Climatic Conditions

January remains the coldest month during the year with average mean temperature around 20^0C during the night. The month of May remains the hottest month with average mean temperature around 27^0C. The maximum and minimum temperatures vary from the above mean temperature by about 6^0C to 8^0C both the sides during day and night. The mean annual temperature is about 15^0C. Owing to its location in high mountainous region the area is subjected to intermittent rainfall during the year, with the major precipitation occurring during the monsoon months. The mean annual rainfall in the region is around 1888.5 mm. The relative humidity varies from 35% to 90% in the area.

5.7.6 Population

The project area including the stream basin is very sparely populated. The literacy level is low. Marginal agriculture and cottage industry are the occupations of the local population.

5.7.7 Natural Resources

The basin does not have any mineral resources of any commercial significance. The basin area is a reserved forest with considerable forest resources. The forest area comprises of dense mixed jungle of Khirsu, Pine, Banjh, Burans, Surai trees etc.

5.7.8 Socio-Economic Aspect

Economically, the area is very backward and the population can be generally termed as poor. The majority of population depend upon marginal cultivation in the terraced fields or work as labour in nearby urban. /Semi-urban centers like Guptkashi, and Ukhimath, Agastyamuni etc. or in the construction activities undertaken by Central / state Government agencies in the nearby areas. With major hydro – electric projects like Vishnuprayag, Tamak – Lata, Lata-Tapovan, Tapovan-Vishnugad etc. coming up in the close vicinity, employment opportunities will eventually increase, uplifting thereby the economic conditions of the local population.

5.7.9 History

The hill regions of Uttarakhand is endowed with vast amount of hydroelectric resources estimated at 27000 MW out of which only 3600 MW have been harnessed till date. Towards making Uttarakhand the *"Urja Pradesh"* in the country, the State policy has been focused for accelerated development of hydropower sites in the state. Bhagirathi, Alaknanda and Yamuna form the major river systems in the state with large discharges and high gradient.

5.7.10 Necessity, Needs and Opportunity for Development

The objective of the proposed Madhyamaheshwar Ganga SHP is to harness untapped renewable energy contained in numerous hill streams, and rivers in the state of Uttarakhand to meet the growing energy needs in the state without resorting to obtaining from polluting and costlier sources, open up employment opportunities by making available cheap hydro power for especially power intensive industries and to provide cheap hydropower to its population for their socio-economic upliftment as well as for improving their living conditions and lifestyles.

5.7.11 Construction Contract

As the construction programme is very tight, a very effective plan for construction is required. The entire work is proposed to be split up into the following packages so that parallel activities in more than one front can be taken up simultaneously for expediting the execution process: (i) Supply of electro-mechanical equipment, its erection and commissioning, and switchyard equipment. (ii) Diversion weir, intake and desilting tank. (iii) Water conductor system comprising of tunnel, open power channel, feeder tunnel, etc. (iv) Forebay, penstocks, power house building, switchyard and tail race.

5.7. 12 Manpower Planning

On the peak of the activity about 100 unskilled labours will be required who could be hired locally. The skilled labours have to be inducted from outside the project area and from the as far as Rishikesh / Dehradun. The contractors will organize the man power requirement.

5.7.13 Socio-Economic Conditions

The location of human settlements (villages) falling within a radius of 5.0 km from the power house of Madhyamaheshwar Ganga project. The information collected from selected villages and supported by census data in respectof population etc. is described.

Out of these villages socio-economic data has been collected which are as follows.

- The males constitute about 50.32% and the females 49.68% of the population.
- The farmers constitute the main population (more than 50%), followed by labours (around 20%), service men (about 15%), business men (5%), artisans (about 2%) and others (about 8%).

- Literacy is 36.39% in the case of males and only 17.13% in case of females. Illiteracy is dominant (46.48%) in the area which co9mprises mostly amongst grown adults (about 45 years of age). Literacy is better in younger generation (about 80%). Female adults are most illiterate. Literacy has reached to a level of about 85% in rich farmers, service and business class.
- Families of labour class and artisans are largest having 8 to 9 members followed by small and marginal farmers. Families of medium and large farmers, business and service class are comparatively small (5 to 7 members).
- Housing and sanitation are poor in most of the villages. Only few houses belonging to rich farmers are pucca. These farmers have their gaushalas in the cultivation fields also. The others are having houses in which the ground floor is gaushala and first floor is used for living. Ventilation is invariably poor in most houses.
- Electricity is available in Guptakashi and Ukhimath and bigger villages. Small villages are not yet electrified.
- Wood is used as fuel and it is obtained from the forest.
- Grazing grounds are mostly on the hill slopes in the forest.
- Cottage industry is cropping up in some villages in the area.

5.7.14 Human Migration

Human migration is common in the area. Literate persons have adopted service as profession and are migrating mostly to the plains. In the recent past people have started shifting to nearby towns in search of better living.

5.7.15 Role of Women

Women from the main working group in these areas and are relatively much more active than men. They manage the house hold, fetch water, collect firewood and carry out most of the jobs in the fields too.

5.7.16 Regional effects

The project being small enough small enough is not likely to have any regional effects, except that during the construction period it will fetch labour and skilled persons of the nearby and distant places. For that limited period, it will be creating job opportunities to a number of persons. Few people will also get the opportunity of self employment.

5.7.17 Income and amenity

Farming is main source of income. Alternate sources of income are service, potato, orange, apple, dairy, sheep and goats, poneys and labour etc. income in the area varies widely from place to place and family to family. Each family in the village is trying to augment its income through additional sources.

5.7.18 Health

In general, people in the area are healthy, except for few aged persons, some of whom have been found suffering from T.B While persons suffering from common diseases are occasionally found, contagious diseases are rare. Infectious diseases are also uncommon. Water borne diseased during rainy season are quite common.

5.7.19 Water and Sanitation

The drinking water is available in most of the villages of the project area. It is potable but very safe. The problem of sanitation is severe. The villages do not have proper drainage and there is no system for sewer disposal. The disposals and wastes from gaushalas and houses flow into village lanes and cause considerable sanitation hazards.

5.7.20 Habitation

Most of the villages in the area are having lifestyles quite different from one class to another class. The large farmers and rich persons are having pucca houses with tin roof top and false ceiling of wooden planks. In contrast the marginal farmers, artisans and Harijans are having houses with walls of stone with slates used for the roof. Nearly all the houses are having gaushalas on the ground floors. The large and medium farmers are having their gaushalas on their farm land. Thus the living for rich and medium farmers is more or less neat and clean. Few rich people have started providing flush type WC in their houses. Now many houses are being constructed with brick masonry and RCC roof.

Appendix9:Case Protocol

A. Organizational Implementers - Madhmeshwar

1. According to you, which trade set do you find is insufficient?
2. Among these trade set which trade sets would you like to procure locally at construction site?
3. What are the different strategies do you use to hire the required trade sets at the location site?
4. What is the purpose of using this strategy?
5. During what stage is the strategy planned and implemented?
6. Who is the driving force behind each strategy?
7. Challenges faced by each strategy?
8. Requisites required for each strategy?
9. What are the benefits that the organization is seeking from the implemented strategy?
10. What are the benefits that the organization is offering to the community for the implemented strategy?

B. Contractors -Madhmeshwar

1. According to you, which trade set do you find is insufficient?
2. Among these trade set which trade sets would you like to procure locally at construction site?
3. What are the different strategies do you use to hire the required trade sets at the location site?
4. What is the purpose of using this strategy?
5. During what stage is the strategy planned and implemented?
6. Who is the driving force behind each strategy?
7. Challenges faced by each strategy?
8. Requisites required for each strategy?
9. What are the benefits that the organization is seeking from the implemented strategy?

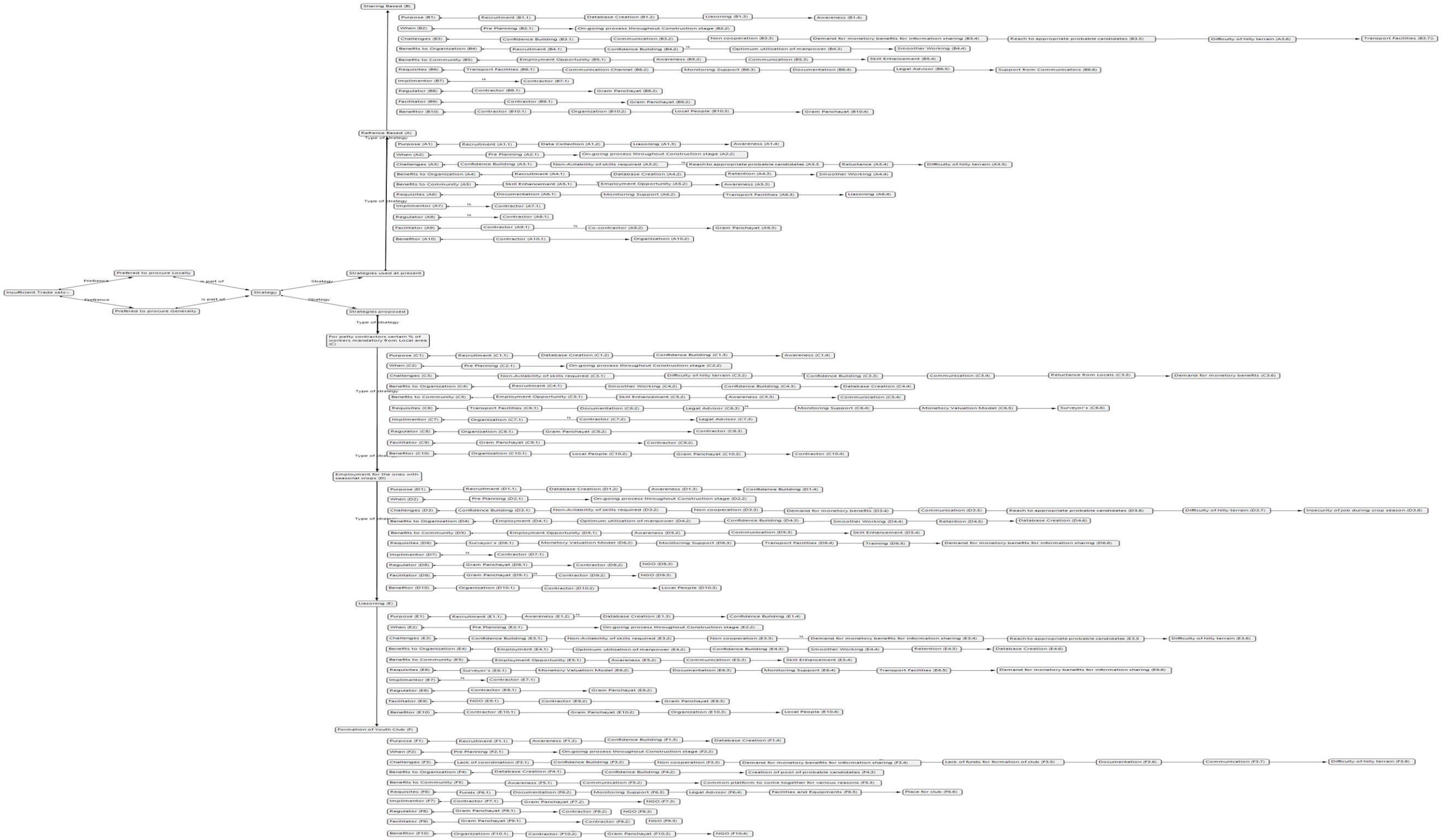
C. Labor Union Members -Madhmeshwar

1. According to you, which trade set do you find is insufficient at the construction site of the small hydro power project?
2. What is the organization doing at present to fill these significant skill gaps?
3. What is the organization doing at present to fill these significant skill gaps in the local area at the construction site of the project?
4. What extra benefits should be given to workers working on the construction site so that more workers participate?
5. What activities should be done by the organization on the project site location so that more locals wish to work with them?
6. What types of training should be given to the ones who are locally recruited?
7. What are the different ways in which training should be given?

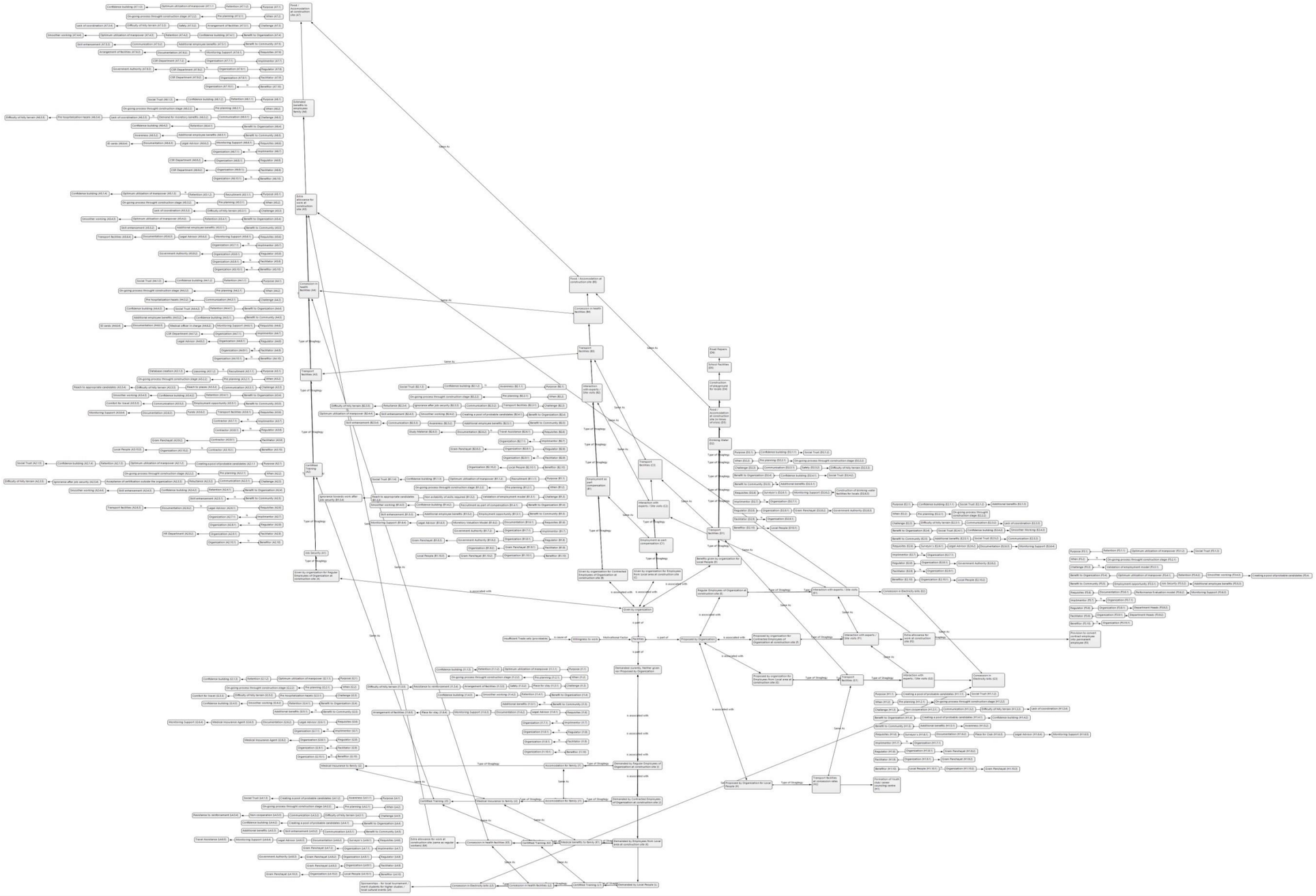
D. Gram Panchayat Members - Madhmeshwar

1. How much according to you is the willingness of the local people to work for the organization?
2. What are the motivating factors for the local people to work for the organization?
3. What more facilities should be given by the organization for people in the local area to attract more workforces?
4. The facilities/ benefits claimed by the organization are they being received by the local community?
5. What benefits must be given for the local community?
6. What benefits must be given to employees working with organization from the local community?
7. By giving all these benefits to the organization benefit in return?

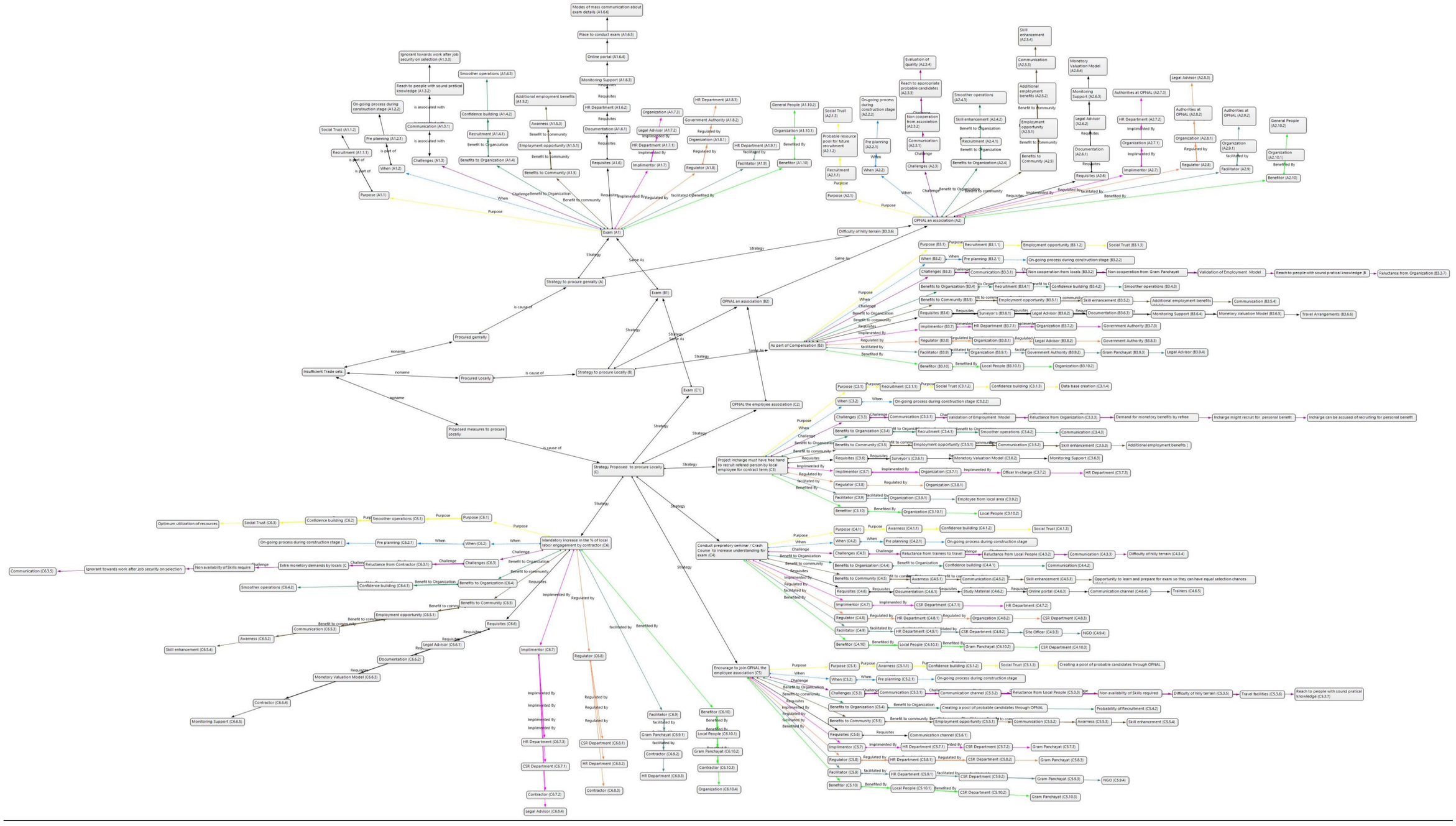
Appendix10: Axial Code-Respondents Contractors



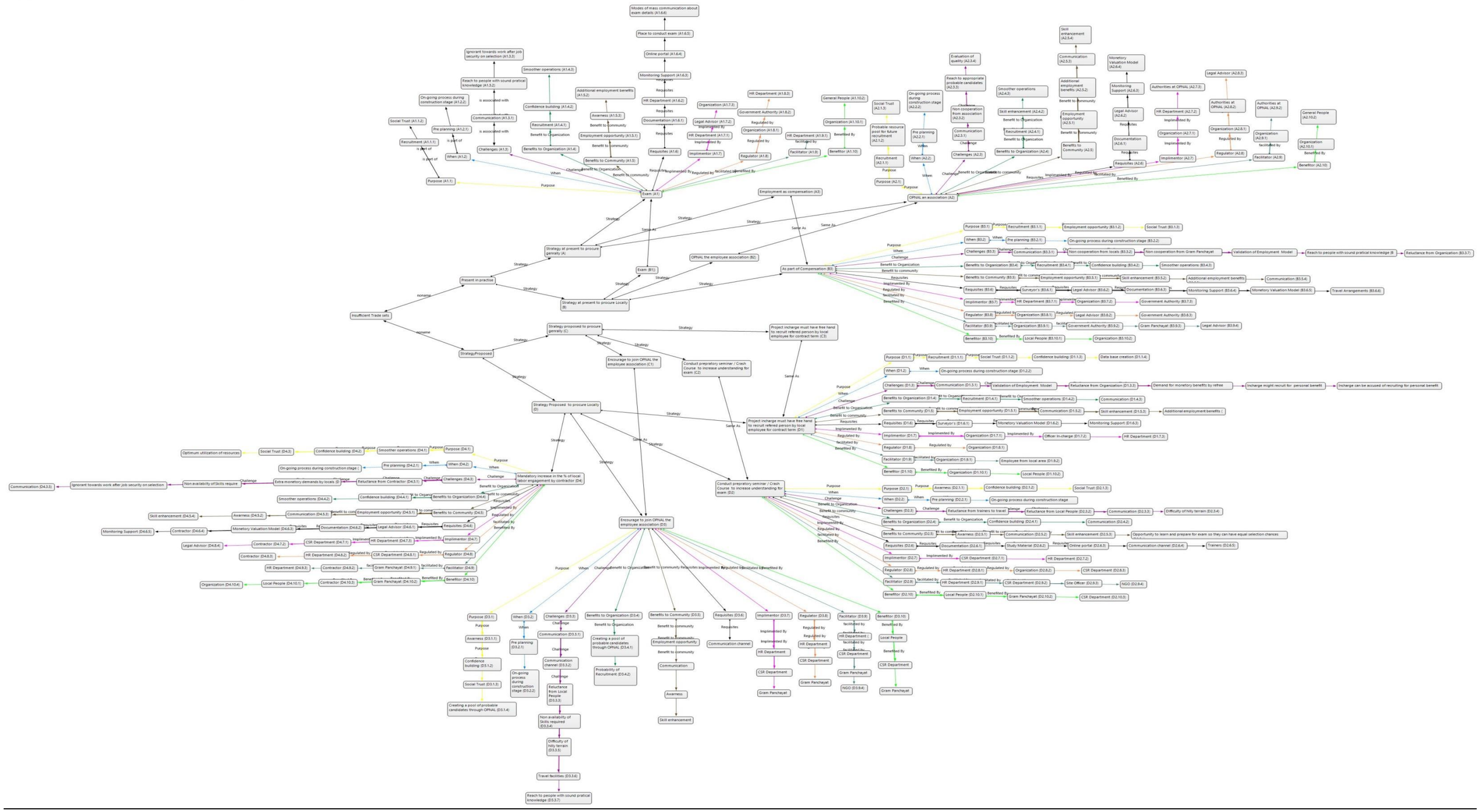
Appendix11: Axial Code– Respondents members of Gram Panchayat



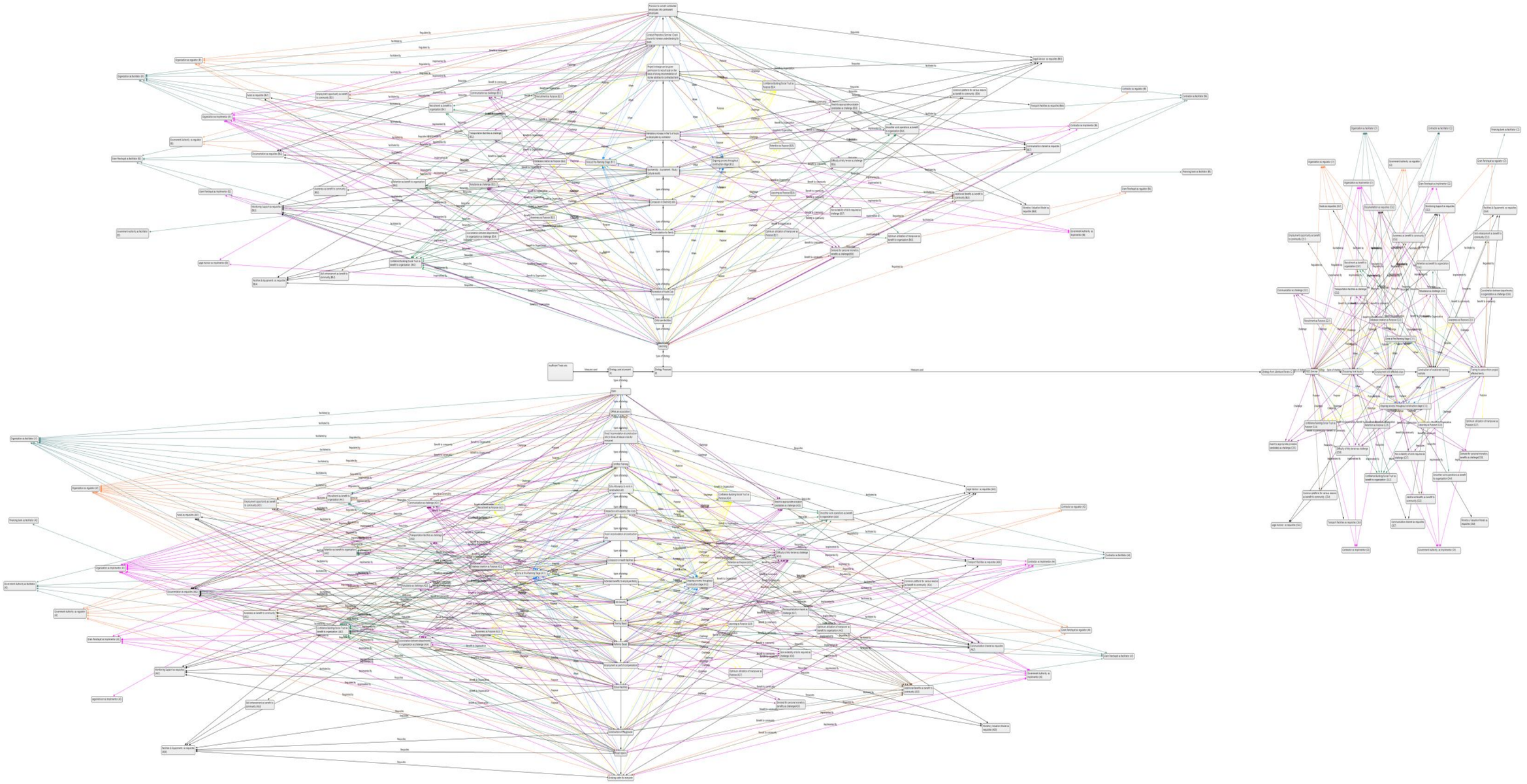
Appendix12: Axial Code – Respondents Members of UJVNL



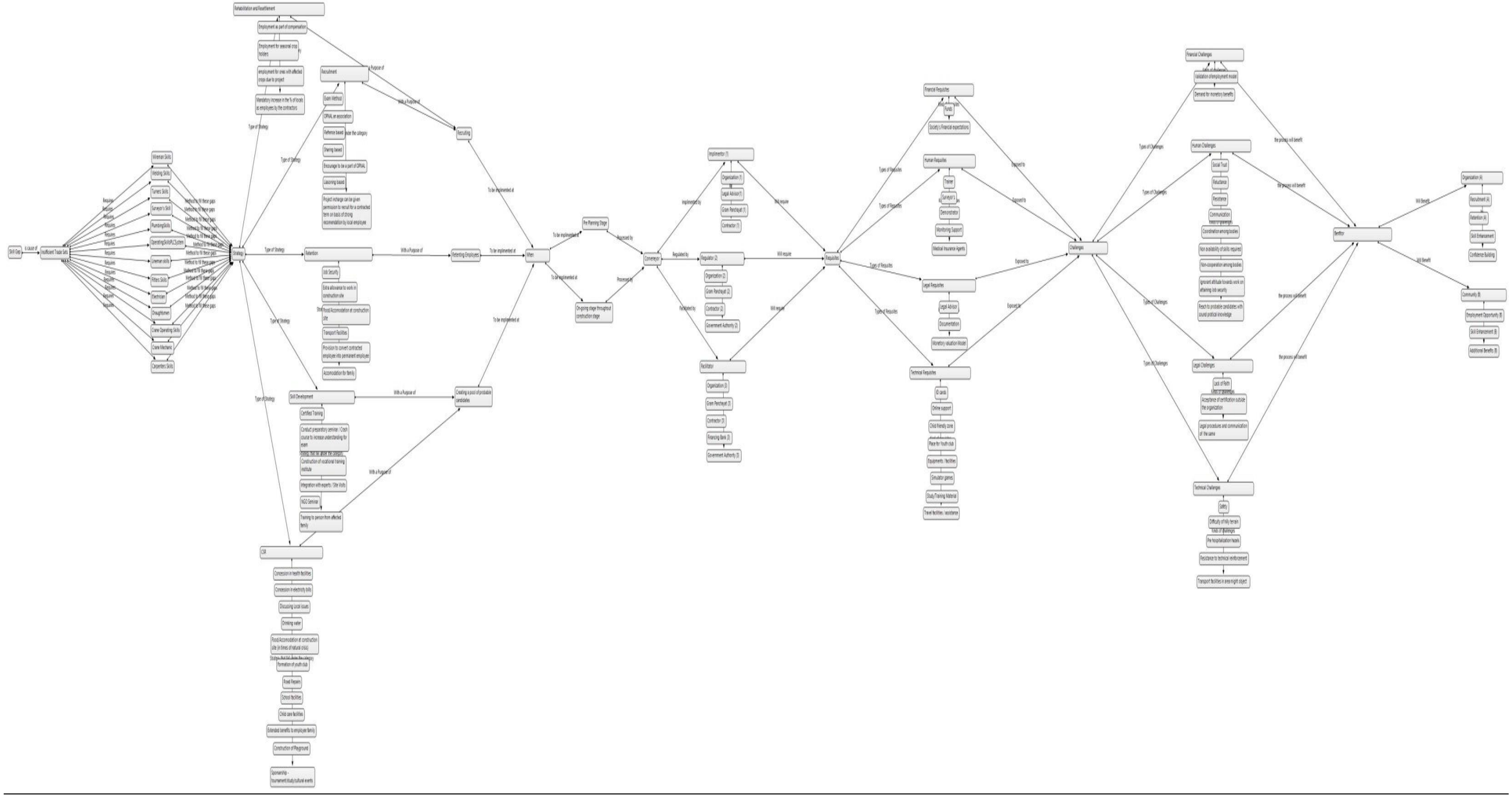
Appendix13: Axial Code– Respondents Members of Labor Union



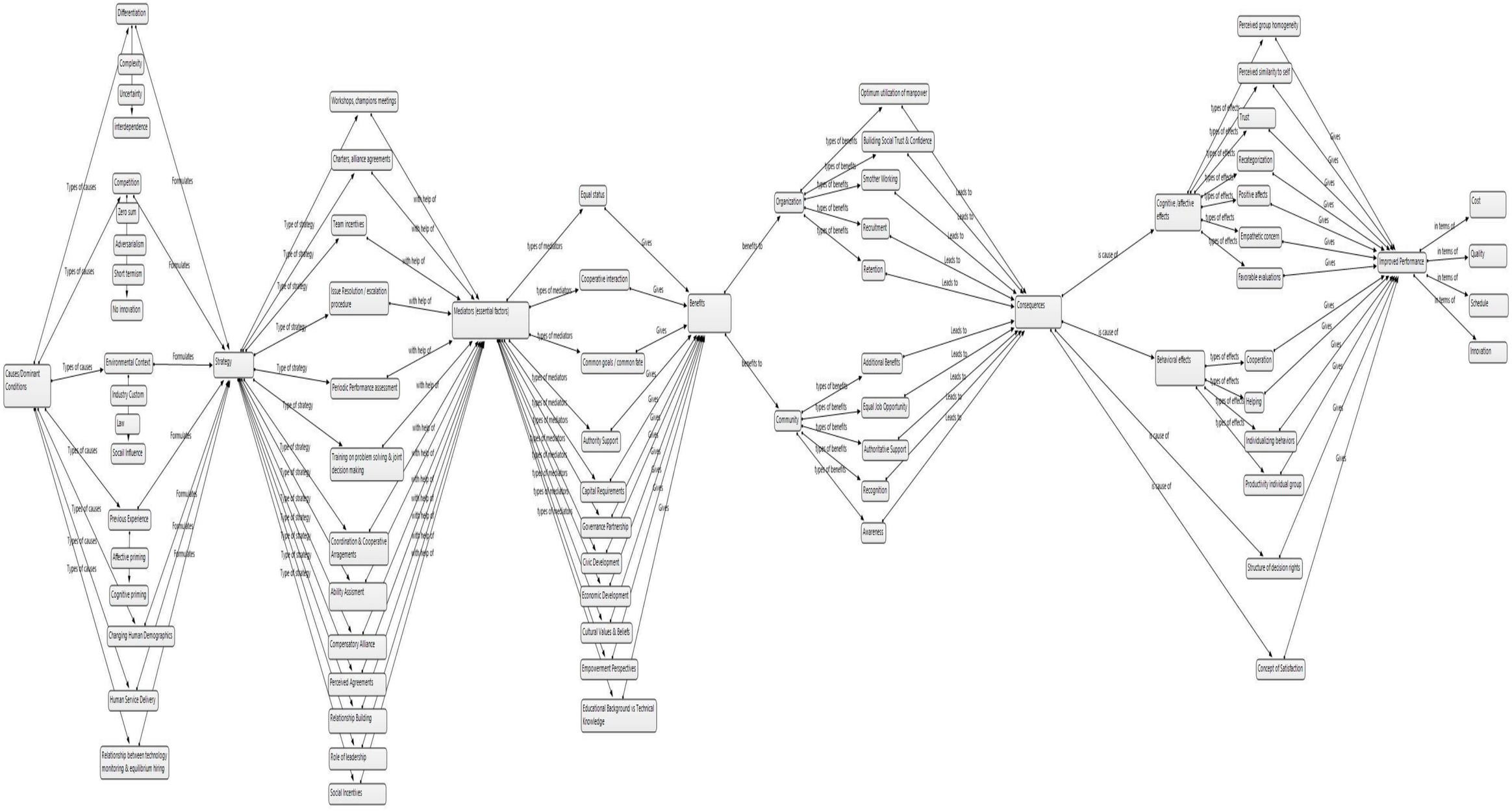
Appendix23: Selective Code Sheet



Appendix15: Triangulation Sheet



Appendix16: Theory of Partnership (Behavioral Relationship)



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5. Freelance Content Writer at BPT Solutions Pvt. Ltd., Noida. (09/08/2010 to 15/05/2013)

PUBLICATIONS

1. Case Study – "Avika Fuel Center", Registered at IIM-Indore.
2. Research Paper "Challenges in sourcing skilled manpower for small hydro powerprojects in India: A review" Published in Conference Proceedings of International Conference on Management of Infrastructure (ICMI); UPES, Dehradun
3. Research Paper "Skill Gaps at the Hydro-Mechanical Stage of Small Hydro Power Projects in the State of Uttrakhand: An Analysis" published in International Journal of Business and Management Invention ISSN (Online): 2319 – 8028, ISSN (Print): 2319 – 801X www.ijbmi.org || Volume 5 Issue 11 || November. 2016 || PP—44-51
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4. Certificate Course in NGO Management from IGNOU (Feb 2013)
5. Certificate in English and Communication Skills Course from Amity Institute of Corporate Communication (Dec 2012)
6. Certificate in Foreign Language – Spanish from Amity School of Foreign Language (Dec 2012)
7. Certificate in Behavioral Sciences Course on various Behavioral Skills –
    - Self-Management Skills
    - Emotional Competence
    - Positive Attitude
    - Behavioral Communication Competence
    - Leadership and Team Spirit
    - Interpersonal Relationship Skills
    - Conflict Management Skills
    - Stress Coping Strategies

    From Amity Institute of Psychology and Allied Sciences (Dec 2012)
8. Diploma in Women Empowerment and Development from IGNOU.

RESEARCH PROJECT EXPERIANCES

1. Student Research Paper Presentation on the topic – 'The market potential and the customer's perception towards the brand Virgin Atlantic'. Presented at Amity Global Business School, London (U.K) Part of Curriculum
2. Student Research Paper Presentation on the topic – ' Providing health care facilities to people of all income levels with public private initiative – Analyzing and evaluating the growing demands of the health care facilities'. Presented at Amity International Business School, Noida (India)
3. Researcher as a student- Intern in the H.R Department of BIG 92.7 FM – New Delhi Station (24/05/2009 to 10/07/2009). Topic – 'Performance Appraisal of the employees based at the New Delhi Station'. Research done under the guidance of Mr. ManashBaruha, Regional Head, New Delhi Station.
4. Researcher as a Student- Intern at ONGC, Accounts Section, Central Workshop, Vadodara (26/05/2008 to 18/07/2008). Topic – 'Understanding the finance and accounts process at the Central Workshop'. Research done under the guidance of Mr. KiranGhadge, I/c finance, CWS, Vadodara.

CO-CURRICULAR ACTIVITIES

1. Participated in a two-day Workshop on Emerging Pedagogies in Management Education (WEPME-2014) at Indian Institute of Management (IIM) – Indore (6-7, June 2014)
2. Founder Member of a NGO – "AVIKA CARE AND HERITAGE FOUNDATION" Dehradun. (April 2013)
3. Participated in Faculty Development Program at Mewar Institute (Ghaziabad) and scored 'A+++' grade

4. Represented India in 'Future World Leaders Summit – Presidential Classroom' in Georgetown

   University at Washington D.C. (U.S.A). I was selected as the graduation Banquet Speaker among 500 students across the globe (22-29th July 2006)
5. Represented Mexico in 'Indian Model United Nations (INMUM)' organized by Ryan International School (Sep 2005)
6. Anchored as the Masters of Ceremony at 7-Kumaon Regiment of Indian Army for a 5 day Golden Jubilee Event
7. Anchored as Masters of ceremony at various college events at Amity International Business School.

HOBBIES

1. Playing Golf and Squash
2. Listening music
3. Traveling

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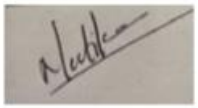
PLAGIARISM CERTIFICATE

1. We **Dr. Atul Razdan** (Internal Guide), **Dr. R Jayaraj** (Co Guide/ External Guide) certify that the Thesis titled **Measures to promote local participation for sourcing of skilled manpower in Small Hydro Power Projects in Uttarakhand** submitted by Scholar Ms **Neetika Sharma Mehta** having SAP ID **500036318** has been run through a Plagiarism Check Software and the Plagiarism Percentage is reported to be **10%**.

2. Plagiarism Report generated by the Plagiarism Software is attached .

Signature of the Internal Guide

Signature of External Guide/ Co Guide



Signature of the Scholar

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ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to University of Petroleum and Energy Studies Student Paper	%4
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	2012. Publication	
9	Subhes C. Bhattacharyya. "Shaping a sustainable energy future for India: Management challenges", Energy Policy, 2010 Publication	<%1
10	discovery.ucl.ac.uk Internet Source	<%1
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