

MULTI-SKILLING IN CONSTRUCTION INDUSTRY AND DUAL SKILL LABOUR STRATEGY: A CASE OF CONSTRUCTION COMPANIES IN PORT HARCOURT

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ABSTRACT

Multi-skilling in the construction industry with emphasis on dual skill labour strategy is presented. The experiences from resident engineers, project engineers and skilled workers in construction companies resided in Rivers State were employed through questionnaires. This was basically to know the problems associated with the utilization of skilled workers sub craft. The dual skill labour strategy was used to demonstrate the effectiveness of multi-skilling through a duly completed one story building by construction company CONSULTREX. Results showed high agreement between resident engineers and project managers on the benefits of multi-skilling in the construction industry. There was high level of disagreement on the problems that hinder the use of multi-skilling in the construction industry. The view from the skilled workers is that the major problems with the utilization of multi-skilling in the construction industry are the fear of low quality jobs. Results further showed that 3,000,000 Naira (USD 15,000) can be saved from the total project cost of a story building construction if dual skill strategy were to be applied. Dual skill strategy is only profitable when 10 – 30% of the skilled worker's salary is added as payment to the other skilled workers with the sub craft.

Key words: Labour strategy, Port Harcourt, Construction Industry

Cite this Article: Ify L. Nwaogazie, Onome O. Augustine and Terry Henshaw, Multi-skilling in Construction Industry and Dual Skill Labour Strategy: A Case of Construction Companies in Port Harcourt. *International Journal of Civil Engineering and Technology*, 7(4), 2016, pp.208–222.

<http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=7&IType=4>

1. INTRODUCTION

The concept of multi-skilling could trace back in time when mega structures like the Egyptian pyramid and the Great Wall of China were built. According to the Institute of Construction, multi-skilling is a labor utilization strategy where workers possess a range of skills appropriate for more than one work process and the use of these skills are flexibly on different projects within the same organization. Multi-skilling is a very important concept in the global construction industry, as studies done on multi-skilling proved that there is significant reduction in the labour cost and required workforce needed. Burleson (1998) reported that there could be a 5-20% labour cost saving, a 35% reduction in required workforce, a 47% increase in average employment duration and an increase in earning potential for the multi-skilled construction worker if the concept of multi-skilling is applied to the construction industry. The potential for multi-skilling in the construction industry is an aspect of cost reduction benefit that has been poorly utilized. One of the main challenges globally and locally has been labor productivity and craft training. More flexible labor strategies should be able to meet these challenges and improve project down times, quality and the utilization of current pool of trained/ experienced workers.

Multi-skilling is a managerial strategy with intent to develop competency within a workforce and harness the full utilization of skills and experience within the same workforce.

In Nigeria, construction industries have not fully understood or applied this concept and that's why there have been more frequent lapses in meeting project proposed dates and savings in cost. These failures are mostly attributed to lack of skilled workers, poor project scheduling and poor management of funds. The concept of multi-skilling has long been applied to areas of production and positive results have been significant in terms of cost benefit. The construction industry has been sluggish on this multi-skilling concept as it has been perceived to reduce project quality but in recent time's research such as those of Williamson (1992); Cross (1996) and Burleson et al. (1998) have proven possible improvement of this concept in the construction industry.

In developed countries multi-skilling as carpentry and piping; crane operators and truck drivers have been the norm that has improved project labor cost, duration of project and idle times in projects. The concept of multi-skilling solves increased labor cost problems in a win-win manner. This is because the company reduces its overall labor cost and the multi-skilled worker increases his take home allowance.

The aim of this work is to carry out analysis on why multi-skilling is not common in the construction industry and to demonstrate the effect of multi-skilling on labor cost in the construction industry using a sample job of company 'A' construction company. A selection of other references considered relevant to this work are CII (1997), Adrain (1987), Emad (2010), Fox and Yuen (2004), Ukaa (2013), Schultz (2003) and Ejowhomul and Olomolaiye (2006).

2. MATERIALS AND METHODS

2.1. Study Area

The study area for this work is Rivers State which is surrounded by Imo State, and Abia State on the North East; Akwa Ibom State on the South East and Bayelsa State on the West respectively (see Figure 1). It is a high activity region with many construction and oil & gas activities. With the situation of the Niger Delta development commission (NDDC) headquarters in the State, many construction companies have been contracted to do jobs in this area. Popular construction companies like HOMAN construction, Global construction, MCC construction, Julius Berger construction and Monopolu construction companies have all carried out significant construction works in the State.

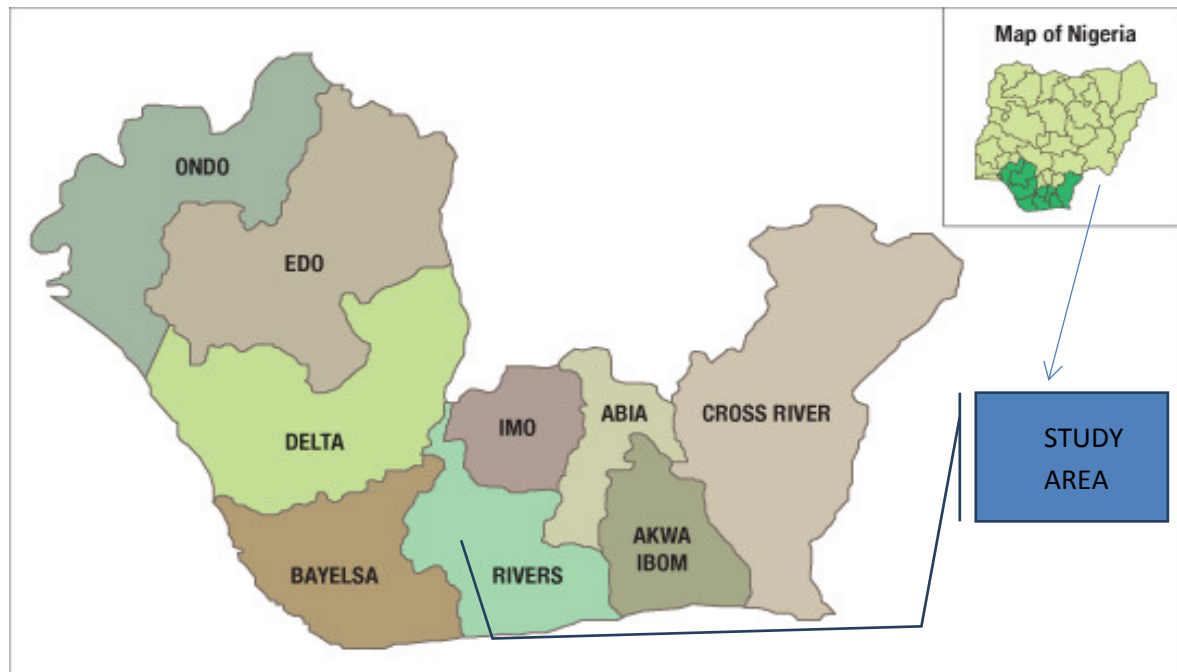


Figure 1: Map of Nigeria showing Niger Delta, Rivers State and Study Area.

2.2. Data collection

For the purpose of this work questionnaires were designed and distributed to project engineers and resident engineers (See Appendix 1) and other information regarding skills and use of skills were collected from skilled workers (see Appendix 2)

2.3. Data Analysis

The Principal Component Analysis (PCA) tool embedded in the Microsoft Excel 2010 version is used to analyze the questionnaires. Table 1 shows the summary of questionnaire responds from the resident engineers and the project managers. Figures 2 to 5 show the PCA results.

2.4. Demonstration of Multi-Skilling (Dual Skill Labour Strategy)

With the information obtained from construction company CONSULTREX, we demonstrated the effect of multi-skilling on the cost of a project. The personnel needed for this job are summarized in Table 2 and the total cost for the project is presented as Table 3.

Multi-skilling in Construction Industry and Dual Skill Labour Strategy: A Case of Construction Companies in Port Harcourt

Table 2 Various Craft Type Needed for the Project

S/N	Craft Type	Number Needed
1	Labourer	8
2	Carpenter	5
3	Mason	3
4	Iron worker	5
5	Equipment operator	2
6	Tiler	3
7	Electrician	2
8	Plumber	2
	Total	30

Table 3 Economic Analysis of Baseline Labour Strategy (Entire Project)

Craft Type	Number Needed	Salary Per Month [±]	Direct Wages for The Project	Small Tools/PPE	Total Project Labour Cost
Labourer	8	₦ 55,000	₦ 2,640,000	₦ 96,000	₦ 2,736,000
Carpenter	5	₦ 75,000	₦ 2,250,000	₦ 60,000	₦ 2,310,000
Mason	3	₦ 80,000	₦ 1,440,000	₦ 36,000	₦ 1,476,000
Iron worker	5	₦ 70,000	₦ 2,100,000	₦ 60,000	₦ 2,160,000
Equipment Operator	2	₦ 100,000	₦ 1,200,000	₦ 24,000	₦ 1,224,000
Tiler	3	₦ 65,000	₦ 1,170,000	₦ 36,000	₦ 1,206,000
Electrician	2	₦ 80,000	₦ 960,000	₦ 24,000	₦ 984,000
Plumber	2	₦ 75,000	₦ 900,000	₦ 24,000	₦ 924,000
Total	30		₦ 12,660,000	₦ 360,000	₦ 13,020,000

NB: Project Duration is for 6 months. [±]Salary in local currency (Naira)

Table 1 Summary of Questionnaires for Project Managers and Resident Engineers

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35		
Q1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Q2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Q3	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	
Q4	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	
Q5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
Q6	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Q7	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Q8	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Q9	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Q10	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Q11	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4
Q12	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
Q13	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Q14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
Q15	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Q16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
Q17	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
Q18	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Q19	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
Q20	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Q21	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2

1-Strongly Agree; 2-Agree; 3-Disagree and 4-Strongly Disagree

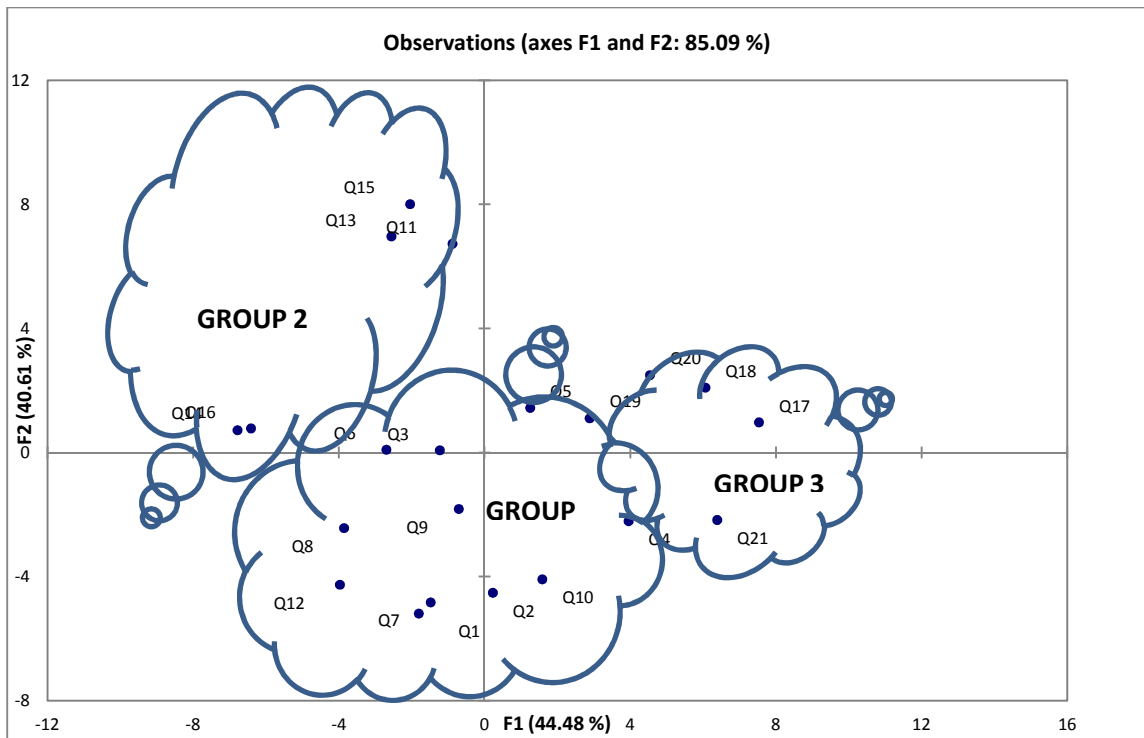


Figure 2 PCA Analysis of Table 3.

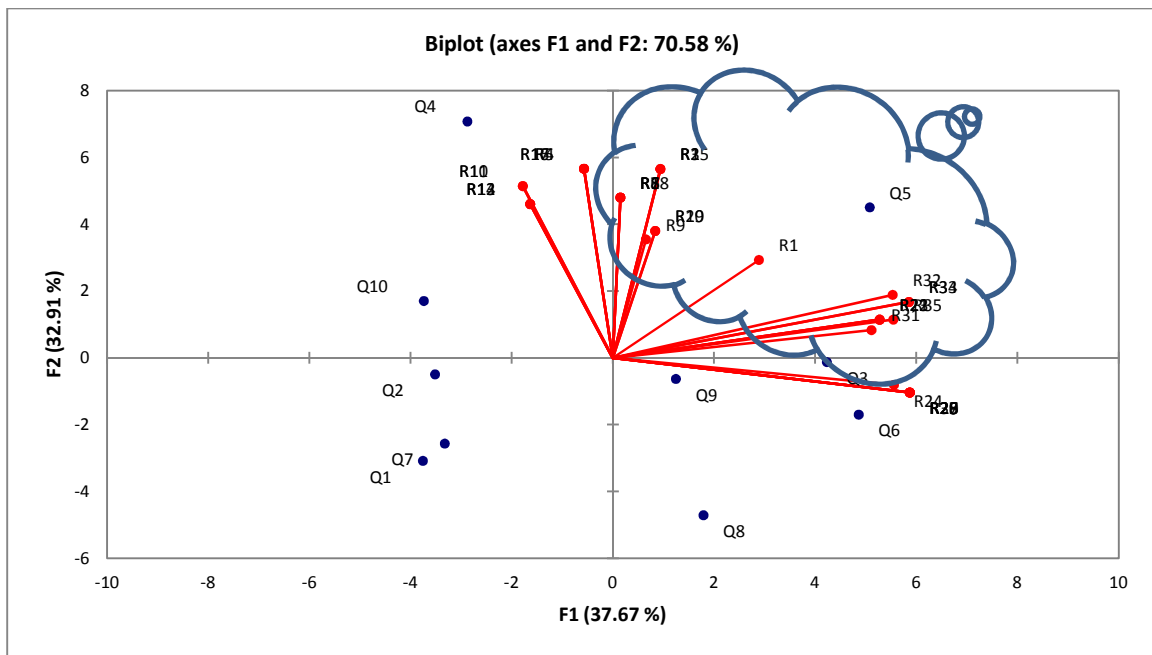


Figure 3 PCA Analysis for GP1.

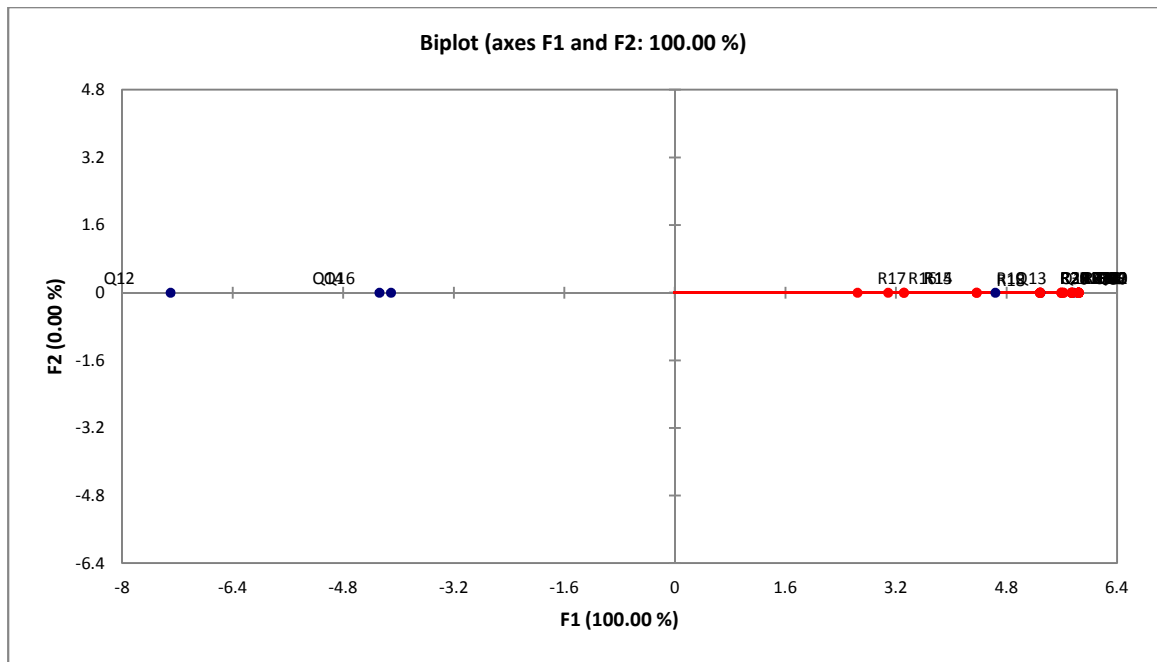


Figure 4 PCA Analysis for GP2

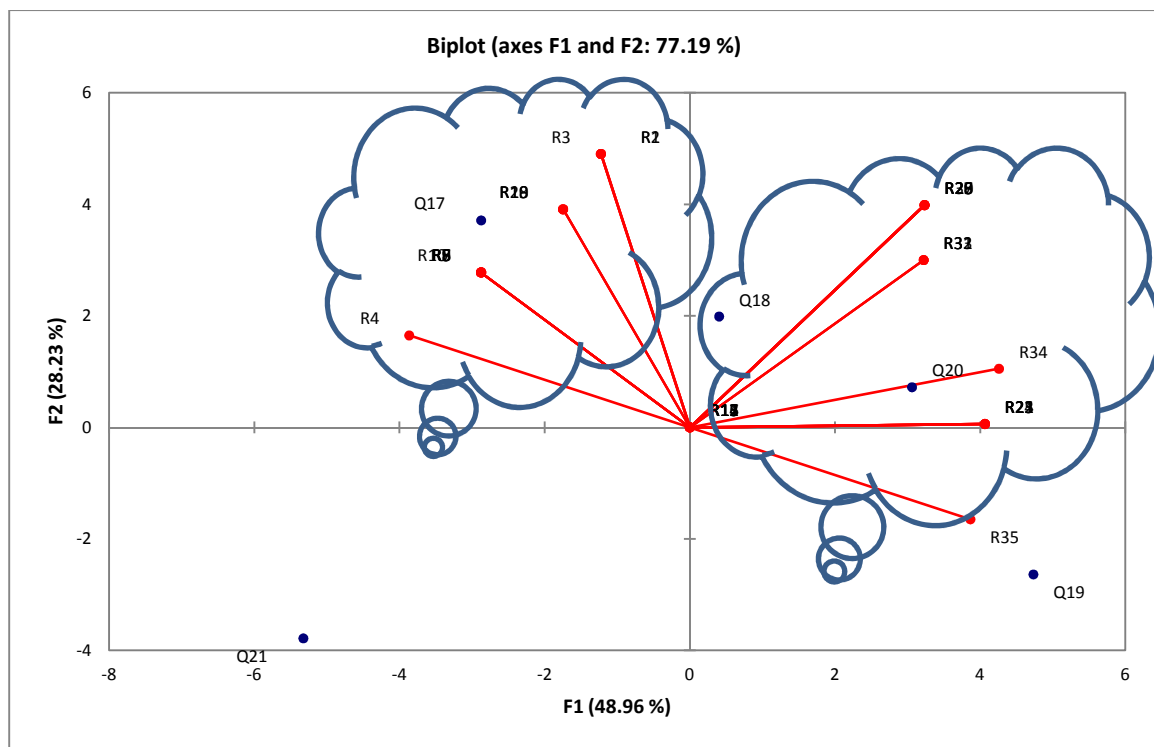


Figure 5 PCA Analysis for GP3

The baseline craft curve is plotted for each skilled worker for the entire duration of the project and skills were merged. That of the mason and the carpenter is presented from Figures 6 to 8.

Multi-skilling in Construction Industry and Dual Skill Labour Strategy: A Case of Construction Companies in Port Harcourt

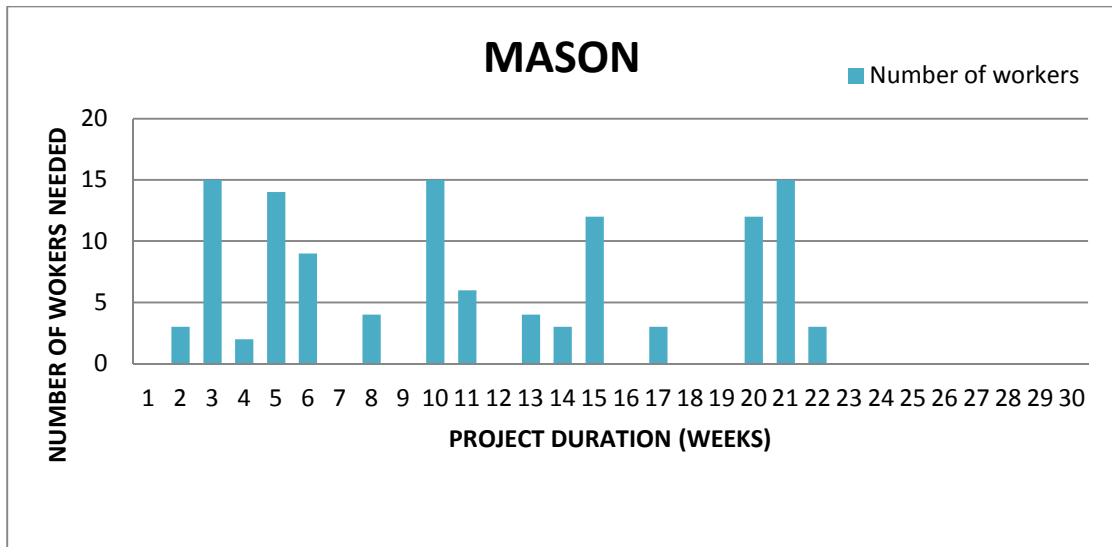


Figure 6 Baseline Craft curve for Mason

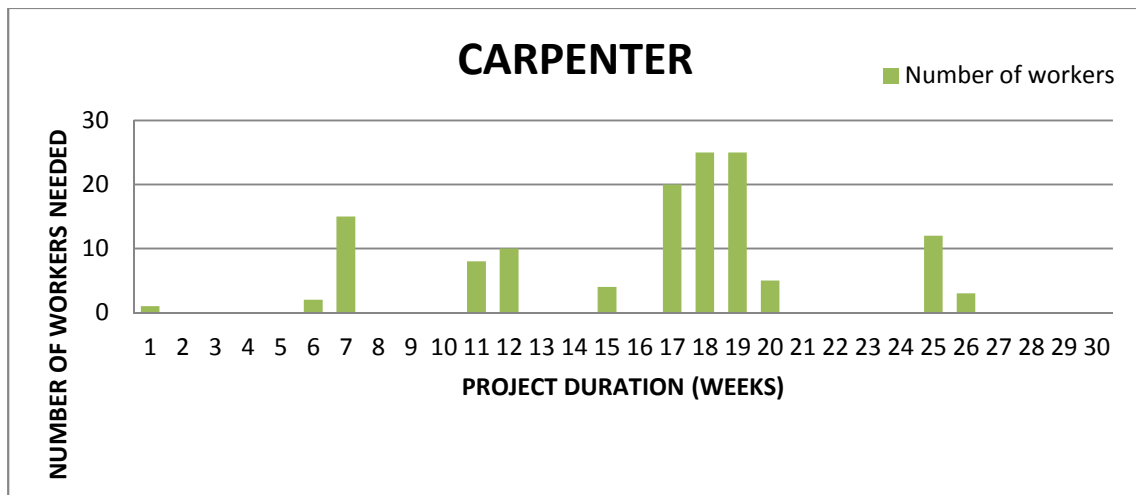


Figure 7 Baseline Craft Curve for Carpenter

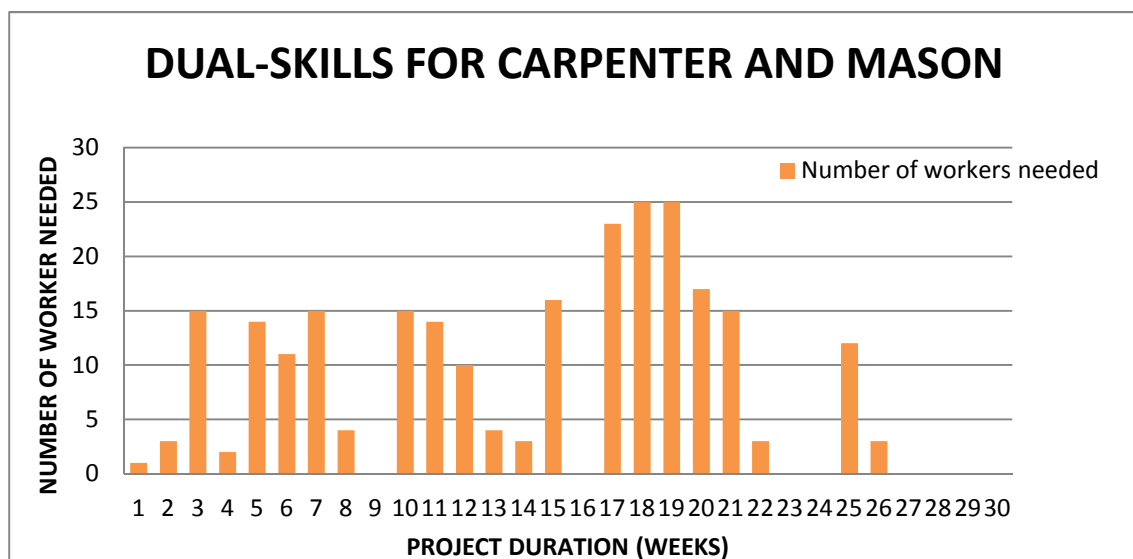


Figure 8: Craft Curve for the Dual Skill of Carpenter and Mason

With this analysis the new requirement of workers based on the multi-skilling concept is presented in Table 4.

Table 4 Number of Workers Needed using Dual Skill Strategy

S/N	Main Craft	Sub-Craft	Number of Worker Needed
1	Labourer	Electrician	6
2	Carpenter	Mason	3
3	Mason	Carpenter	2
4	Iron worker	Plumber	3
5	Equipment Operator	Tiler	1
6	Tiler	Equipment operator	2
7	Electrician	Tiler	2
8	Plumber	Iron worker	2
		Total	21

The total cost of the project based on the new number of workers adequate for the project is estimated. The total cost is estimated for different percentages of the sub craft salary added to the main craft (see Tables 5 – 6).

Table 5 Economic Analysis of Dual Skill Labour strategy when 10% of the Sub Craft Salary was added to the Main Craft Salary

DUAL SKILL CONSIDERING 10% OF SUB CRAFT SALARY						
S/N	Main Craft	Number Needed	Salary Per Month	Direct Wages for The Project	Small Tools/PPE	Total Project Labour Cost
1	Labourer	6	₦ 378,000	₦ 2,268,000	₦ 72,000	₦ 2,340,000
2	Carpenter	3	₦ 498,000	₦ 1,494,000	₦ 36,000	₦ 1,530,000
3	Mason	2	₦ 525,000	₦ 1,050,000	₦ 24,000	₦ 1,074,000
4	Iron worker	3	₦ 465,000	₦ 1,395,000	₦ 36,000	₦ 1,431,000
5	Equipment Operator	1	₦ 639,000	₦ 639,000	₦ 12,000	₦ 651,000
6	Tiler	2	₦ 450,000	₦ 900,000	₦ 24,000	₦ 924,000
7	Electrician	2	₦ 519,000	₦ 1,038,000	₦ 24,000	₦ 1,062,000
8	Plumber	2	₦ 492,000	₦ 984,000	₦ 24,000	₦ 1,008,000
	Total	21		₦ 9,768,000	₦ 252,000	₦ 10,020,000

Table 6: Economic analysis of Dual Skill Labour Strategy when 20% to 100% of the Sub Craft Salary was added to the Main Craft Salary

DUAL SKILL CONSIDERING 20% to 100% OF SUB CRAFT SALARY										
S/N	MAIN CRAFT	TOTAL PROJECT LABOUR COST (20%)	TOTAL PROJECT LABOUR COST (30%)	TOTAL PROJECT LABOUR COST (40%)	TOTAL PROJECT LABOUR COST (50%)	TOTAL PROJECT LABOUR COST (60%)	TOTAL PROJECT LABOUR COST (70%)	TOTAL PROJECT LABOUR COST (80%)	TOTAL PROJECT LABOUR COST (90%)	TOTAL PROJECT LABOUR COST (100%)
1	Labourer	₦ 2,628,000	₦ 2,916,000	₦ 3,204,000	₦ 3,492,000	₦ 3,780,000	₦ 4,068,000	₦ 4,356,000	₦ 4,644,000	₦ 4,932,000
2	Carpenter	₦ 1,674,000	₦ 1,818,000	₦ 1,962,000	₦ 2,106,000	₦ 2,250,000	₦ 2,394,000	₦ 2,538,000	₦ 2,682,000	₦ 2,826,000
3	Mason	₦ 1,164,000	₦ 1,254,000	₦ 1,344,000	₦ 1,434,000	₦ 1,524,000	₦ 1,614,000	₦ 1,704,000	₦ 1,794,000	₦ 1,884,000
4	Iron worker	₦ 1,566,000	₦ 1,701,000	₦ 1,836,000	₦ 1,971,000	₦ 2,106,000	₦ 2,241,000	₦ 2,376,000	₦ 2,511,000	₦ 2,646,000
5	Equipment Operator	₦ 690,000	₦ 729,000	₦ 768,000	₦ 807,000	₦ 846,000	₦ 885,000	₦ 924,000	₦ 963,000	₦ 1,002,000
6	Tiler	₦ 1,044,000	₦ 1,164,000	₦ 1,284,000	₦ 1,404,000	₦ 1,524,000	₦ 1,644,000	₦ 1,764,000	₦ 1,884,000	₦ 2,004,000
7	Electrician	₦ 1,140,000	₦ 1,218,000	₦ 1,296,000	₦ 1,374,000	₦ 1,452,000	₦ 1,530,000	₦ 1,608,000	₦ 1,686,000	₦ 1,764,000
8	Plumber	₦ 1,092,000	₦ 1,176,000	₦ 1,260,000	₦ 1,344,000	₦ 1,428,000	₦ 1,512,000	₦ 1,596,000	₦ 1,680,000	₦ 1,764,000
	Total	₦ 10,998,000	₦ 11,976,000	₦ 12,954,000	₦ 13,932,000	₦ 14,910,000	₦ 15,888,000	₦ 16,866,000	₦ 17,844,000	₦ 18,822,000

3. DISCUSSION

From analysis the PCA grouped the questionnaire into three groups of questions (see Figure 2) which were sorted out ideally to be, Group question 1 (GP1): there are benefits from multi-skilling (Question 1 to 10). Group question 2 (GP2): multi-skilling is hindered by the skilled workers (Questions 11 to 16). Group question 3(GP3): multi-skilling is hindered by the construction industries (Questions 17 to 21). Further analysis of the grouped questionnaire with PCA, indicates a strong agreement for the first part of the questionnaire which was about the benefit of multi-skilling to the construction companies. The result obtained which showed a commonality of 71% indicated that workers had the idea about the benefit of multi-skilling to them or the company.

The second part of the questionnaire focused on what is hindering the company from having a multi-skilled workforce. The managers and engineers of the company answered this part of the questionnaire and result obtained showed very high commonality of 100% between the questions and respondents. This means there might be an element of truth that multi-skilling is hindered by the skilled workers even though the resident engineers were of the view that the multi-skilling is hindered by the company while the project managers were of the opposite view. The third part of the questionnaire also showed a high commonality ratio of 78% between the questions and respondents. This means there might be an element of truth that multi-skilling is hindered by the construction industries though the project managers agreed that the workers are the cause, that dual skilling concept is not used in their construction industry.

Analysis from the questionnaire distributed to the skilled workers (see Appendix 2) showed that the major fear of the companies was the results of poorly constructed jobs. This indicated poor training of the skilled workers on other skills which agreed with the resident engineers that the construction company was the cause in the hindering of multi-skilling (see Figure 9).

The dual skill labour utilization strategy was evaluated. From the economic analysis of the project that was carried out by CONSULTREX Company A, it was seen that if the dual skill was employed, there could have been a significant reduction in the project labour cost at some percentage of the sub craft take home pay (see Figure 10). Using the dual skill labour strategy lead to a maximum labour cost saving of three million naira (N 3,000,000) which is about 23% of the project labour cost at 10% of the sub craft salary and it also led to a reduction in the workforce by about 30% (see Table 4). From the analysis it is clearly seen that if multi-skilling was employed to the construction of the one storey building there would have been a significant labour cost saving.

Multi-skilling in Construction Industry and Dual Skill Labour Strategy: A Case of Construction Companies in Port Harcourt

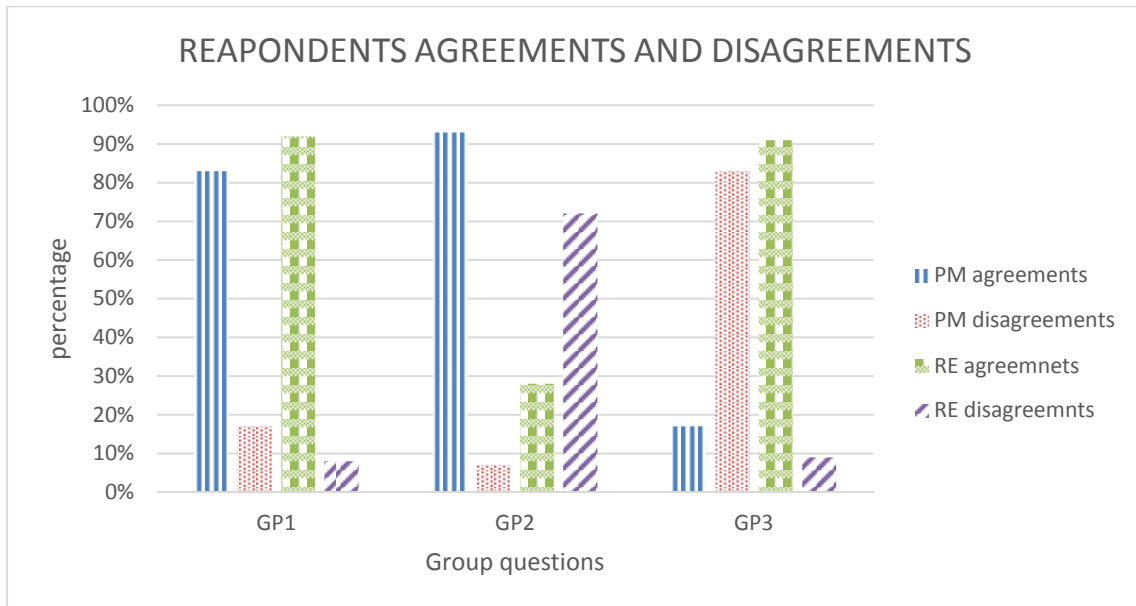


Figure 9: Summary of Respondent Agreements and Disagreements

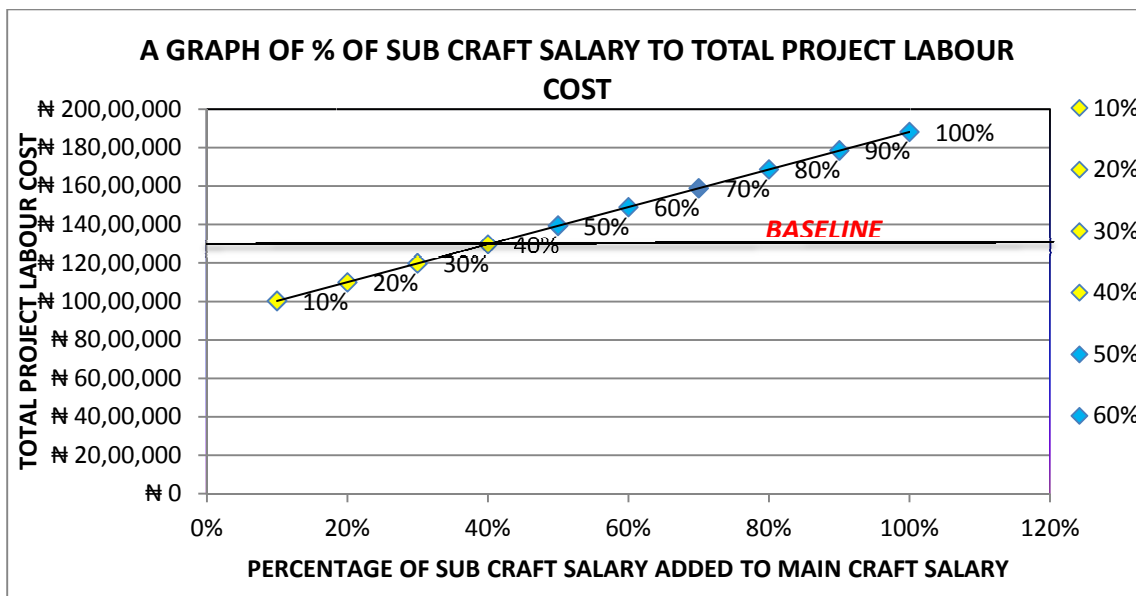


Figure 10: Percentage of Sub Craft Salary Added to Total Project Cost.

4. CONCLUSION

The following can be concluded from this work:

- Multi-skilling is beneficial to the construction industry;
- The construction companies in Rivers State hinder multi skilling through lack of sub craft trainings;
- Dual skill strategy of multi-skilling can save as high as 30% of the total cost on a project; and
- Dual skill strategy becomes non profitable from the point where upwards of 40% percent of the sub craft salary is added to the main craft.

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APPENDIX 1

Table 1: Questionnaire Distributed to Resident Engineers and Project Managers

S/N	Question Parameter±	Respondents Options For service users			
		SA	A	DA	SD
1	Multi-skilling reduces idle time of worker				
2	Multi-skilling enhances productivity				
3	Because of multi-skilling company tend to retain workers longer.				
4	Multi-skilling helps to improve safety of worker on site because of better awareness of other hazard from other crafts				
5	The quality of works tends to increase because of a multi-skilled workforce.				
6	More salary/wages will be given to a worker who possesses more than one skill.				
7	Multi-skilling helps in making one have better understanding of other craft				
8	Workers will have a higher security of their job				
9	It will give one better opportunities in advancement in the company				
10	It will lead to less cost in the cost of personnel				
11	Workers do not want to learn new skills				
12	Workers take pride in the skill they already possess.				
13	There is always union issues when workers want to be trained to possess multiple skills				
14	Workers leave the company that trained them				
15	Multi-skilling tends to hinder work on sites.				
16	Increase in the skill of worker tends to pave way for worker demanding greater salary.				
17	Companies do not want to get involved because of cost.				
18	Multi-skilling leads to changes in the construction management system and this is not good for construction companies.				
19	Companies believe multi-skilling makes workers feel indispensable.				
20	Companies feel multi-skilling reduces quality of work.				
21	Companies do not believe multi-skilling brings about significant cost savings				

±Multi-Skilling is Beneficial to the Construction Industry

APPENDIX 2

Table 1: Summary of Questionnaire for Construction Skilled Workers

S/N	Question	Number	Percentage
1	Number of respondents that learnt their major skills by training	80	100
2	Number of respondents that learnt their major skills by watching professional when less busy	0	0
3	Number of respondents that learnt other skills by training	0	0
4	Number of respondents that learnt other skills by watching professional when less busy	35	44
5	Number of respondents that have their company use their other skills	10	13
6	Number of respondents who think it is out of fear for low quality job that makes their company not recognize their other skills	80	100