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STATISTICAL RATINGS OF LABOUR PRODUCTIVITY INFLUENCING FACTORS IN THE NIGERIA CONSTRUCTION INDUSTRY.

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ABSTRACT

With a meager growth rate of 1.2 percent from 2011 to 2019, Nigerian labor productivity has remained consistently low and unsatisfactory. As a result of this, as well as other considerations, numerous construction projects in the country have been abandoned. The factors impacting labor productivity on building projects in Nigeria were ranked in this study. A questionnaire survey of 500 stakeholders in the building construction business was conducted to achieve this. Management and control (MC), Workforce (W), Material & Equipment (ME), Finance (F), Project (P), and External (E) are the six (6) key areas of labor productivity factors (E). The data from the questionnaire survey were subjected to a Pearson Correlation and Relative Importance Index test. Management and control with workfoce factors showed the strongest correlation in causing project cost overrun, management and control with finance factors for project time delay while workforce and material/equipment factors influence project quality. The scatter chart ranking result revealed that management and control elements have the greatest impact on cost overruns and project delays, while workforce has the greatest impact on project quality. This research showed that a solid management and workforce is key to consistent productivity that enhances good project performance in the Nigeria construction industry.

1.0 INTRODUCTION

The ability of a country to increase national output growth over time is almost entirely dependent on the size and productivity of its labor force (Qaisar and Foreman-Peck, 2007). The rate of increase in worker productivity in Nigeria has been disappointing (Umoru and Yaqub, 2013). Indeed, GDP per worker has fallen dramatically over time, with labor productivity in the manufacturing and construction subsectors falling by 23.59 percent and 22.53 percent, respectively, between 2011 and 2016. (National Bureau of Statistics, 2016). The country's current severe economic climate has caused productivity to plummet, resulting in a slew of issues ranging from exorbitant building costs to large differences between projected and actual development timelines, leading to project abandonment in some cases.

2.0 LITERATURE REVIEW

2.1 Labour Productivity in the Nigeria Construction Industry

A task that demands the exertion of both the body and the mind is referred to as labor. In construction, labor is also seen as a valuable resource because it is the one who brings together all of the other resources, such as materials, plant equipment, and financing, to make the various construction products as defined by (Fagbenle, 2011). Productivity, on the other hand, is a broad measure of performance that takes efficiency into account (Fagbenle, 2011). Productivity is defined as a ratio of a volume measure of output to a volume measure of input consumption by the Organization for Economic Co-operation and Development (OECD)(OECD, 2001). Productivity, according to Attar et al. (2012), is defined as the measurement of how successfully an individual entity uses available resources to produce outputs from inputs. To put it another way, productivity entails achieving the best level of performance with the least amount of resources. However, all contracting organizations must solve productivity challenges in order to obtain the full economic worth of labor. Productivity is one of the most important factors in a company's performance and market competitiveness (Mojahed et al, 2008).

The building industry is vital to the national economy because it provides infrastructure and a safe haven for other economic activities. Construction is an important sector of the national economy for countries all over the world, according to Attar et al. (2012). It employs a significant share of the country's workforce and contributes significantly to the country's overall revenue. The construction industry is one of the top five sectors used to calculate a country's National Gross Capital Formation (NGCF) and Gross Domestic Product (GDP). Its impact on all other sectors makes it a crucial frontier for long-term development (Attar et al., 2012). The Nigerian construction industry, on the other hand, continues to face numerous obstacles, including a lack of technical and man-

agement expertise, as well as a lack of financial, material, and equipment capital. Because of the usage of low-tech tools and a high number of untrained people, the construction industry is seen as a low-productivity sector. Low salaries, a lack of resources, and an unfavorable working environment were noted by Ameh and Osegbo (2011) as having a significant impact on the productivity of craftsmen employed in in-situ concrete operations in single-story building projects in Nigeria.

2.2 Factors Inflencing Construction Labour Productivity

Labor productivity is influenced by both external and internal factors in general (Durdey and Mbacchu, 2011). He divided the productivity variables into two groups: external factors, which are those that are beyond the control of the company's management, and internal factors, which are those that originate within the organization. Furthermore, because construction is an outdoor profession, weather conditions have a significant impact on its performance. Other external elements influencing task operations and productivity, in addition to the factors mentioned, are health and safety standards, as well as codes of practice. In the internal category, management shortcomings may lead to resource waste and productivity losses; adoption of current technology and laborer training, on the other hand, would boost productivity.

Low pay, a shortage of supplies, and an unfavorable working environment are all factors hurting productivity in Nigeria (Adamu et al, 2011). Non-productive or down time will result from late delivery of materials or personnel, equipment malfunctions, inadequate work plan layout, and inability to provide information). Reworks, degree of competence and experience of the personnel, suitability of method of construction, buildability concerns, and poor supervision and coordination were the restrictions having the greatest influence on productivity in New Zealand, according to Durdyev and Mbachu (2011).

2.3 Past Studies on Optimization in Construction

Kazaz et al. [2016] found 37 characteristics and divided them into four categories: organizational, economic, physical, and socio-physiological. Analyze the factor dispersion within a group as well as the compactness of each factor group. The findings revealed that the organizational factors group has the greatest weighted mean and lowest standard deviation values, making it the most significant. Raj et al. [2014] concentrated on human resource management in the sector of construction. They conduct a questionnaire study of 100 workers from various companies. In addition, the impact of human resource management strategies on the construction industry's productivity and financial performance was investigated. They found that 75% of participants agree that site

congestion causes them to work in an uncomfortable manner. Shashank et al. [2014] classified factors affecting labor productivity into six categories: motivation, manpower, material/equipment, safety, managerial, and quality. They found that the motivation component has the greatest impact on labor productivity

3.0 METHODOLOGY

3.1. Study Area

The study area selected for this research in Nigeria is Lagos State. This choice was based on the fact that the state holds a proportionate large volume of construction activities in the country and its economic viability. Figure 1 showed the map of the study area.

Figure 1: Map of the Study Area (Lagos)

3.2 Questionnaire Design

Questionnaire were used to collect supplementary data. The questionnaire consists of two (2) sections. The demographic section which contained the respondents' information and the respondent analysis section which contain the respondent responses. An Initial total of thirty-nine (39) factors that influence productivity in Nigeria construction project. The factors were grouped into six(6) groups as shown in Table 1. Each respondent was then asked to rate the extent to which each factor influence labor productivity using a given scale called **Linkert scale** of 5 responses which were

- Strongly Influence- 5
- Little Influence - 4
- May or May not Influence- 3
- No influence -2

- Virtually no Influence- 1

The number represent the weights given to each decisions. These weights were used in the relative importance index analysis that followed. A total of five hundred (500) questionnaires were distributed to randomly selected respondents (contractors, consultants, site engineer, project managers, sub-contractors and client), four hundred and forty (440) valid responses were collected and analyzed quantitatively using the SPSS software.

Table 1: Labour productivity factors influencing nigeria construction project

Labor Factor		Observed Variables	
Management and control	MC1	Supervision, performance, monitoring and control	
	MC2	Competencies of the project Manager	
	MC3	Loss in productivity caused from change orders	
	MC4	Lack of capability of contractor's site management to organize on-site works	
	MC5	Adequacy of planning and risk management process	
	MC6	Adequacy of method of construction	
	MC7	Project management style	
	MC8	Lack of coordination among the construction parties	
	MC9	Relationship management/degree of harmony, trust, and cooperation	
	MC10	Project Organizational Culture	
Workforce	W1	Level of skill and experience of the workforce	
	W2	Level of motivation of the workforce	
	W3	Inadequate site staff	

	W4	Level of familiarity with current job and conditions	
	W5	Workforce absenteeism	
	W6	Level of empowerment (training and resourcing).	
	W7	Lack of training and education to implement and operate new technologies	
	W8	Level of involvement of direct labor or subcontract	
Finance	F1	Inadequate supply or high cost of resources: workers, materials, machinery, and money	
	F2	Level of staff turnover/churn rate	
	F3	Reworks because of on-site construction errors	
	F4	Inflation/fluctuations in material prices	
	F5	Fluctuations in exchange rate	
	F6	Late payments	
Project	P1	Site conditions, access, subsoil, topography, and traffic	
	P2	Ground conditions necessitating revisions	
	P3	Project complexity: scale and design	
	P4	Poor buildability design	
Material & Equipment	ME1	Lack of tool and equipment in the market	
	ME2	Suitability or adequacy of the plant and equipment used	
	ME3	Adequacy of technology used	

	ME4	Late supply of construction materials	
	ME5	Material shortage at project site	
External	E1	Poor weather conditions	
	E2	Slow local authority approval	
	E3	Stop work order because of infringement of government regulation	
	E4	On-site accidents/acts of God	
	E5	Unrealistic deadline for project completion set by client	
	E6	Client's over influence on the construction process	

3.3 Questionnaire Analysis

The questionnaire data recovered were subjected to various statistical analyses using the IBM SPSS Statistics 2017 edition. The following were the analysis performed on the data.

3.3.1 Bi-variate Statistical Analysis

The SPSS software was also used in this research to carry out a bi-variate statistical analysis on the collected data. This statistical analysis produced the correlation results for the responses/data collected. The Correlation analysis was computed with SPSS by using the Bi-variate command as follows, Analyze→ Correlate→ Bi-variate → coded responses→ Pearsons→ Two-tailed→ Continue→ OK.

3.3.2 Relative Importance Index Analysis

The Relative Importance Index method (RII) was used to determine the Respondents' perception of the relative importance of the causes of ineffective material management factors. The formula used for calculating the relative importance index (RII) is as follows:

$$\text{Relative Important Index}(\text{R. I. I}) = \frac{\sum_{i=1}^{5}(a_i)(n_i)}{\text{A} \times \text{N}} \quad (1)$$

This can further be written as:

$$\text{Relative Important Index (R. I. I)} = \frac{5_{n_5} + 4_{n_4} + 3_{n_3} + 2_{n_2} + 1_{n_1}}{5\text{N}} \quad (2)$$

for ($0 \leq$ R.I.I ≤ 1)

Where:

n_5 is Number of Respondent for strongly influence

n_4 is Number of Respondent for little influence

n_3 is Number of Respondent for May or May not influence.

n_2 is Number of Respondent for No influence.

n_1 is Number of Respondent for Virtually no influence.

N is Total number of Respondent.

A is Highest weight (as shown in Table 3.2, where A=5)

n is variable expressing frequency of *i*

a_i is Constant expressing weight given to *i*th response: *i*= 1,2,3,4,5.

The constraints with the highest RII value were ranked first (1), the next two (2) and so on.

4.0 RESULT & DISCUSSION

A total of five hundred (500) questionnaires were administered to randomly selected participants across Lagos state in Nigeria. A total of four hundred and forty (440) responses were collected, evaluated and analyzed, representing 88% respondent rate for the research.

4.1 Roles of Respondents

Respondents were divided into four groups: contractors, site engineers, project manager and sub-contractors as shown in table 2. The percentage of each roles that made up the total respondents were shown in a pie chart in figure 2.

Table 2: Roles of Respondents

ROLES	FREQUENCY	PERCENTAGE
Contractor	139	32%
Sub-contractor	95	22%
Site-engineer	84	19%
Project manager	102	23%
Client	20	4%

Total	440	100%

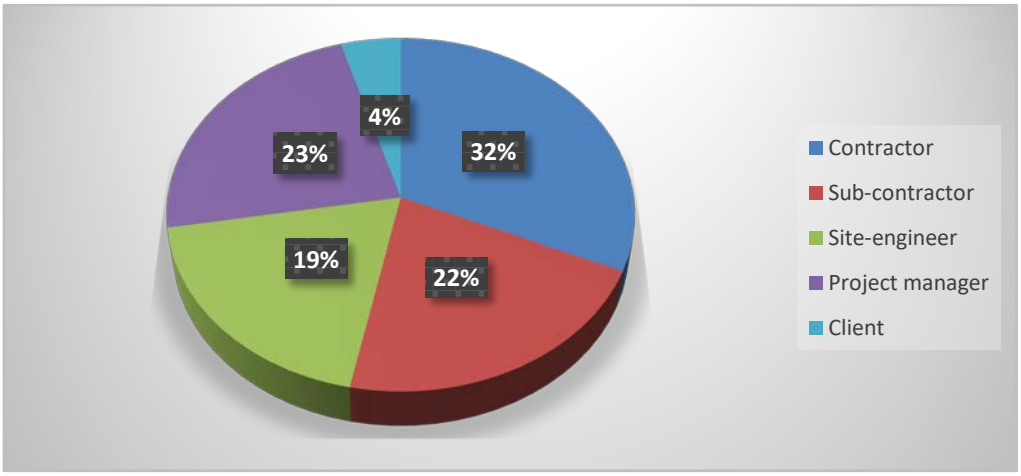

Figure 2: Pie chart representing percentages of Respondents' Role

4.2 Bi-variate analysis result of the labour productivity influening factors

Table 3 shows the inter-constraint correlation matrix for the labour productivity factors as it influences cost overrun when not properly handled. The Pearson correlation shows the strength of the correlation while the Sigmund 2-tailed shows how statistically significant, the correlation between two selected constraints were. Pearson's correlation values less than 0.50 and/or -0.50 signifies weak correlation while greater than 0.50 and/or -0.50 signifies strong correlation. However, a correlation is statistically significant if its "Sig. 2-tailed" is less than (<) 0.05.

Table 3: Inter-Constraint Correlation Matrix of Labor productivity factors as regards cost overrun

		MC	**W**	**F**	**P**	**E**	**ME**
Pearson correlation	**MC**	1.000	0.888	0.721	0.826	0.572	0.661
	W	0.888	1.000	0.679	0.773	0.552	0.715
	F	0.721	0.679	1.000	0.733	0.755	0.542
	P	0.826	0.773	0.733	1.000	0.513	0.579
	E	0.572	0.552	0.755	0.503	1.000	0.507
	ME	0.661	0.715	0.542	0.579	0.507	1.00
		MC	**W**	**F**	**P**	**E**	**ME**
Sig. (2-tailed)	**MC**	.	.000	.000	.000	.006	.001
	W	.000	.	.000	.000	.003	.001
	F	.000	.000	.	.000	.002	.003
	P	.000	.000	.000	.	.000	.005

	E	.006	.003	.002	.000	.	.000
	ME	.001	.001	.003	.005	.000	.
N	**420**						

Where

MC = Management & control

W = Workforce

F = Finance

P= Project

E= External

ME= Material & Equipment

From the result, the strongest correlation occurs between the management & control and the workforce. This is feasible as the management and the control/monitoring strategy used coupled with the skills level/experience would greatly influence the efficiency of the labor-force as regards preventing total project cost overrun., hence the strong 0.888(88.8%) correlation between the two factor groups. Also, all the groups correlation are statically relevant which signifies that each groups justify its inclusion with an appreciable statistical independency.

Table 4: Inter-Constraint Correlation Matrix of Labor productivity factors as regards project time delay.

		MC	**W**	**F**	**P**	**E**	**ME**
Pearson correlation	**MC**	1.000	0.802	0.855	0.734	0.588	0.620
	W	0.802	1.000	0.679	0.789	0.600	0.720
	F	0.721	0.679	1.000	0.813	0.542	0.660
	P	0.734	0.789	0.813	1.000	0.611	0.579
	E	0.588	0.600	0.542	0.611	1.000	0.512
	ME	0.620	0.720	0.660	0.579	0.512	1.00
		MC	**W**	**F**	**P**	**E**	**ME**
Sig. (2-tailed)	**MC**	.	.000	.000	.000	.000	.002
	W	.000	.	.000	.000	.000	.002
	F	.000	.000	.	.000	.001	.003
	P	.000	.000	.000	.	.000	.000
	E	.000	.000	.001	.000	.	.000
	ME	.002	.002	.003	.000	.000	.

N	**420**		

Where

MC = Management & control

W = Workforce

F = Finance

P= Project

E= External

ME= Material & Equipment

Table 4 shows the inter-constraint correlation matrix for the labour productivity factors as it influences project time delay when not properly handled**.** This is feasible as the management and the control/monitoring strategy used coupled with the cash flow level and availability would greatly influence the efficiency and motivate the labor-force in preventing total project time delay., hence the strong 0.855(85.5%) correlation between the two factor groups. Also all the groups correlation are statically relevant which signifies that each groups justify its inclusion with an appreciable statistical independency.

Table 5: Inter-Constraint Correlation Matrix of Labor productivity factors as regards project quality.

		MC	**W**	**F**	**P**	**E**	**ME**
Pearson correlation	**MC**	1.000	0.842	0.811	0.775	0.564	0.549
	W	0.842	1.000	0.764	0.773	0.617	0.848
	F	0.811	0.764	1.000	0.675	0.538	0.780
	P	0.775	0.773	0.675	1.000	0.659	0.740
	E	0.564	0.617	0.538	0.659	1.000	0.619
	ME	0.549	0.848	0.780	0.740	0.619	1.000
		MC	**W**	**F**	**P**	**E**	**ME**
Sig. (2-tailed)	**MC**	.	.000	.000	.000	.001	.000
	W	.000	.	.000	.000	.001	.001
	F	.000	.000	.	.000	.000	.001
	P	.000	.000	.000	.	.000	.000
	E	.001	.001	.000	.000	.	.000
	ME	.000	.001	.001	.000	.000	.
N	**420**						

Where

MC = Management & control

W = Workforce

F = Finance

P= Project

E= External

ME= Material & Equipment

Table 5 shows the inter-constraint correlation matrix for the labour productivity factors as it influences project quality. From the result, the strongest correlation occurs between the workforce and the material & equipment. This is feasible as the skills and experience of the workers coupled with the type of materials and machine used would greatly influence the productivity of the labor-force as regards enhancing good project quality., hence the strong 0.848(84.8%) correlation between the two factor groups. Also all the groups correlation are statically relevant which signifies that each groups justify its inclusion with an appreciable statistical independency.

4.3 Ranking (Relative Important Index) Analysis Result

4.3.1 Ranking result for the Cost overruns Responses

Table 6 showed the Relative Importance Index (RII) result, the Severity index and ranking result for thirty-nine (39) cases of labor productivity influencing factors for cost overruns responses. The ranking pattern and relationship, however, were vividly showed in Figure 3.

Table 6: Labour Productivity Ranking result for cost overrun

S/N	CONSTRAINTS CASES	NO OF RESPONDENTS					T	RII	SEVERITY(I)	RANK
		n1	n2	n3	n4	n5				
1	MC1	9	20	75	110	226	1844	0.83818	83.8182	1st
2	MC2	10	40	80	100	220	1830	0.83182	83.1818	2nd
3	MC4	5	25	92	108	200	1763	0.80136	80.1364	3rd
4	MC8	20	36	88	160	136	1676	0.76182	76.1818	4th
5	MC7	21	55	73	191	100	1614	0.73364	73.3636	5th
6	MC10	25	53	73	192	97	1603	0.72864	72.8636	6th
7	W1	34	65	83	106	152	1597	0.72591	72.5909	7th
8	MC6	27	63	92	144	113	1570	0.71364	71.3636	8th
9	W5	29	65	95	141	110	1558	0.70818	70.8182	9th
10	W2	35	70	86	121	128	1557	0.70773	70.7727	10th
11	MC3	38	55	95	152	100	1541	0.70045	70.0455	11th
12	MC5	27	90	91	112	120	1528	0.69455	69.4545	12th
13	W3	60	65	75	104	136	1511	0.68682	68.6818	13th
14	MC9	55	69	71	145	100	1486	0.67545	67.5455	14th
15	F1	50	85	81	105	119	1478	0.67182	67.1818	15th
16	W4	38	85	107	110	100	1469	0.66773	66.7727	16th
17	F3	13	103	131	110	83	1467	0.66682	66.6818	17th
18	F4	53	80	101	89	117	1457	0.66227	66.2273	18th
19	W8	55	75	122	91	97	1420	0.64545	64.5455	19th
20	F6	58	80	100	116	86	1412	0.64182	64.1818	20th
21	F5	50	95	105	100	90	1405	0.63864	63.8636	21st
22	W6	56	85	103	111	85	1404	0.63818	63.8182	22nd
23	W7	65	82	102	99	92	1391	0.63227	63.2273	23rd
24	F2	105	65	100	54	116	1331	0.605	60.5	24th
25	P1	77	93	158	65	47	1232	0.56	56	25th
26	P3	65	131	145	26	73	1231	0.55955	55.9545	26th
27	P2	90	121	104	65	60	1204	0.54727	54.7273	27th
28	P4	106	115	73	90	56	1195	0.54318	54.3182	28th
29	ME1	91	115	104	90	40	1193	0.54227	54.2273	29th
30	ME2	111	105	101	55	68	1184	0.53818	53.8182	30th
31	ME5	103	120	93	75	49	1167	0.53045	53.0455	31st
32	ME3	122	99	95	85	39	1140	0.51818	51.8182	32nd
33	E1	105	125	101	65	44	1138	0.51727	51.7273	33rd
34	E2	82	101	195	45	17	1134	0.51545	51.5455	34th
35	ME4	137	109	100	55	39	1070	0.48636	48.6364	35th
36	E4	155	125	75	50	35	1005	0.45682	45.6818	36th
37	E5	140	140	93	37	30	997	0.45318	45.3182	37th

38	**E6**		155	116	102	40	27	988	0.44909	44.9091	38th
39	**E3**		192	100	98	28	22	908	0.41273	41.2727	39th

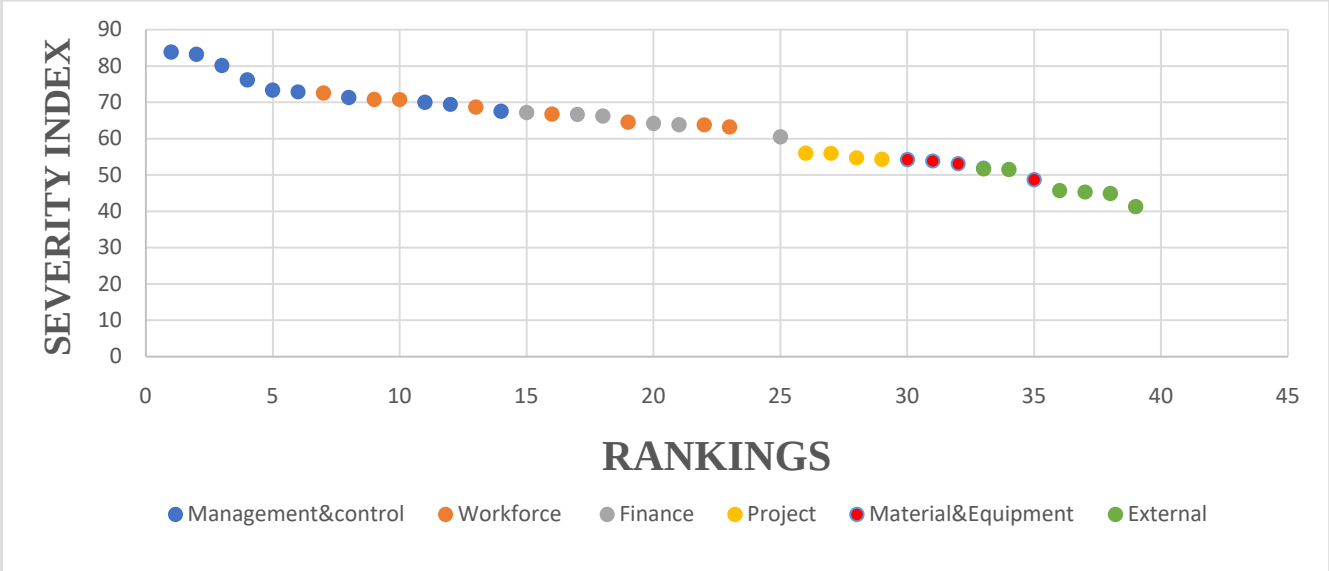

Figure 3: Scatter Chart showing the Responses Factors Ratingsfor Project Cost Overunn.

From Figure 3, management and Control factors was ranked highest influencer of labour productivity followed by the workforce and finance factors. This showed how important the level of management and the quality of the workforce is towards enhancing labor productivity to project completion at budgeted cost. This confirms the accuracy of the correlation results for cost as these two factors showed the highest correlation with one another.

The least two ranked factors were Material & Equipment and External with the latter ranked the least. This also conforms with the correlation results for cost as these two factors showed the least correlation with one another in influencing labour productivity as regards cost.

4.3.2 Ranking result for the Project Delay Responses

Table 7 showed the Relative Importance Index (RII) result, the Severity index and ranking result for thirty-nine (39) cases of labor productivity influencing factors for project delay responses. The ranking pattern and relationship, however were vividly displayed in Figure 4.

Table 7: Labour Productivity Ranking result for project delay

S/N	CONSTRAINTS CASES	NO OF RESPONDENTS					T	RII	SEVERITY(I)	RANK
		n1	n2	n3	n4	n5				
1	MC1	19	30	85	95	211	1769	0.80409	80.4091	1st
2	MC2	22	49	89	88	202	1749	0.795	79.5	2nd
3	MC3	15	35	102	98	190	1733	0.78773	78.7727	3rd
4	MC4	20	41	113	146	120	1625	0.73864	73.8636	4th
5	MC5	24	59	78	181	100	1600	0.72727	72.7273	5th
6	MC8	22	73	100	95	150	1598	0.72636	72.6364	6th
7	MC9	29	65	98	130	118	1563	0.71045	71.0455	7th
8	MC10	32	66	93	119	128	1559	0.70864	70.8636	8th
9	MC7	38	70	89	117	126	1543	0.70136	70.1364	9th
10	F3	43	60	90	137	110	1531	0.69591	69.5909	10th
11	F1	34	82	86	118	120	1528	0.69455	69.4545	11th
12	F4	61	70	82	96	131	1486	0.67545	67.5455	12th
13	F6	60	74	63	133	110	1479	0.67227	67.2273	13th
14	F5	53	90	86	97	118	1469	0.66773	66.7727	14th
15	MC6	40	85	103	112	100	1467	0.66682	66.6818	15th
16	W1	18	101	127	110	84	1461	0.66409	66.4091	16th
17	W2	55	82	105	84	114	1440	0.65455	65.4545	17th
18	F2	53	80	108	96	103	1436	0.65273	65.2727	18th
19	W5	61	82	95	113	89	1407	0.63955	63.9545	19th
20	W3	54	91	102	103	90	1404	0.63818	63.8182	20th
21	W6	62	87	96	108	87	1391	0.63227	63.2273	21st
22	W7	67	84	97	96	96	1390	0.63182	63.1818	22nd
23	P1	79	51	121	111	78	1378	0.62636	62.6364	23rd
24	W4	108	68	95	57	112	1317	0.59864	59.8636	24th
25	P2	80	96	146	68	50	1232	0.56	56	25th
26	P4	61	126	140	30	75	1228	0.55818	55.8182	26th
27	P3	93	116	99	68	64	1214	0.55182	55.1818	27th

28	**ME3**	100	113	78	94	55	1211	0.55045	55.0455	28th
29	**W8**	93	109	100	94	44	1207	0.54864	54.8636	29th
30	**E4**	107	101	104	58	70	1203	0.54682	54.6818	30th
31	**E2**	100	116	96	78	50	1182	0.53727	53.7273	31st
32	**E1**	127	94	90	88	41	1142	0.51909	51.9091	32nd
33	**E3**	105	127	96	68	44	1139	0.51773	51.7727	33rd
34	**E6**	76	110	189	50	15	1138	0.51727	51.7273	34th
35	**E5**	132	113	97	57	41	1082	0.49182	49.1818	35th
36	**ME4**	151	131	73	48	37	1009	0.45864	45.8636	36th
37	**ME2**	138	136	96	40	30	1008	0.45818	45.8182	37th
38	**ME1**	151	119	99	43	28	998	0.45364	45.3636	38th
39	**ME5**	186	103	95	31	25	926	0.42091	42.0909	39th

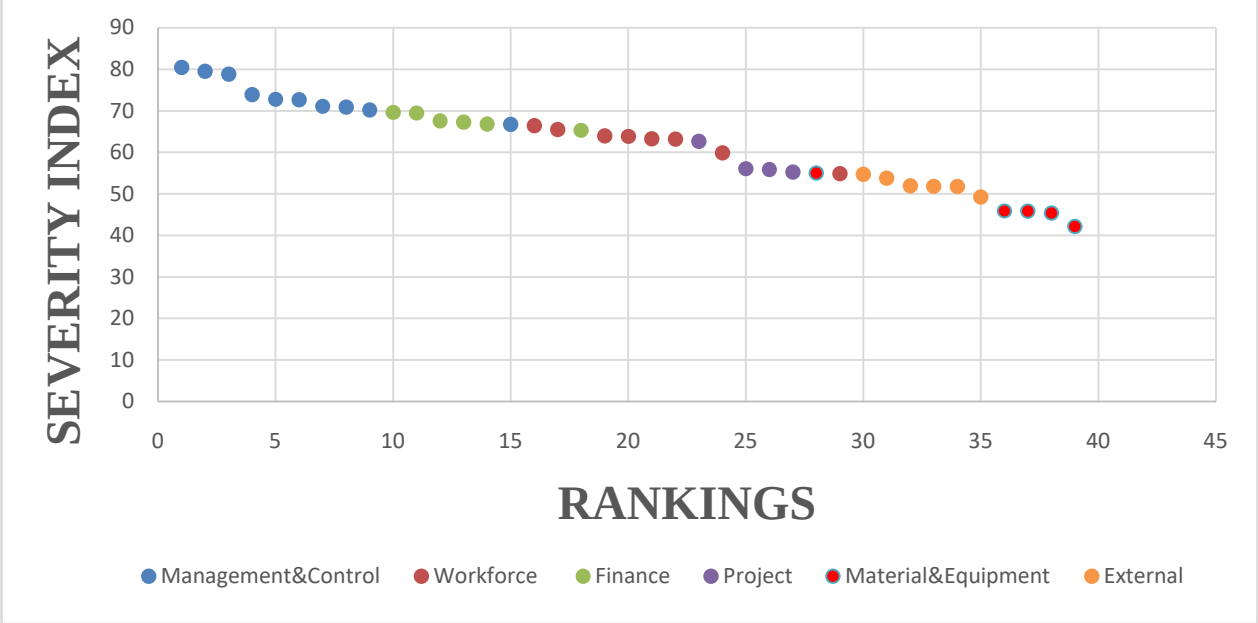

Figure 4: Scatter Chart showing the Responses Factor Ratingsfor Project Delay

From Figure 4, management and Control factors was ranked highest influencer of labour productivity followed by the finance and workforce. This showed how important the level of management and the cashflow is towards enhancing labor productivity to early project completion This also confirms the accuracy of the correlation results for project time as these two factors showed the highest

correlation with one another. The least two ranked factors were Material & Equipment and External with the former ranked the least.

4.3.3 Ranking result for the Project Quality responses

Table 8 showed the Relative Importance Index (RII) result, the Severity index and ranking result for thirty-nine (39) cases of labor productivity influencing factors for project quality responses. . The ranking pattern and relationship, however were vividly displayed in Figure 5.

Table 8: Labour Productivity Ranking result for project quality

S/N	CONSTRAINTS CASES	NO OF RESPONDENTS					T	RII	SEVERITY(I)	RANK
		n1	n2	n3	n4	n5				
1	W2	14	27	87	96	216	1793	0.815	81.5	1st
2	W1	17	45	85	88	205	1739	0.79045	79.0455	2nd
3	W4	16	34	100	98	192	1736	0.78909	78.9091	3rd
4	W3	22	41	103	150	124	1633	0.74227	74.2273	4th
5	ME1	24	54	75	185	104	1617	0.735	73.5	5th
6	W7	20	70	97	90	153	1576	0.71636	71.6364	6th
7	W6	25	59	101	131	121	1575	0.71591	71.5909	7th
8	W8	35	66	92	120	128	1563	0.71045	71.0455	8th
9	W5	40	54	93	140	113	1552	0.70545	70.5455	9th
10	ME2	35	74	88	120	123	1542	0.70091	70.0909	10th
11	ME4	57	67	85	99	132	1502	0.68273	68.2727	11th
12	ME5	55	71	66	136	112	1499	0.68136	68.1364	12th
13	ME3	50	85	89	100	120	1487	0.67591	67.5909	13th
14	MC2	38	87	97	115	103	1478	0.67182	67.1818	14th
15	MC4	20	91	130	113	86	1474	0.67	67	15th
16	MC3	56	85	95	87	117	1444	0.65636	65.6364	16th
17	MC1	54	83	98	99	104	1430	0.65	65	17th
18	MC6	62	85	99	104	92	1405	0.63864	63.8636	18th
19	MC7	56	95	100	95	94	1396	0.63455	63.4545	19th
20	F2	61	89	99	101	90	1390	0.63182	63.1818	20th
21	F1	67	87	100	93	93	1378	0.62636	62.6364	21st
22	MC8	83	55	116	106	80	1365	0.62045	62.0455	22nd

23	**MC9**	112	72	90	52	114	1304	0.59273	59.2727	23rd
24	**F3**	84	100	134	73	50	1228	0.55818	55.8182	24th
25	**F4**	66	131	125	33	78	1225	0.55682	55.6818	25th
26	**MC5**	96	118	90	71	65	1211	0.55045	55.0455	26th
27	**F6**	101	116	66	94	60	1207	0.54864	54.8636	27th
28	**MC10**	93	108	107	85	47	1205	0.54773	54.7727	28th
29	**F5**	97	111	104	85	45	1196	0.54364	54.3636	29th
30	**E2**	112	106	94	56	72	1190	0.54091	54.0909	30th
31	**E1**	104	112	90	82	52	1186	0.53909	53.9091	31st
32	**E4**	130	90	86	90	44	1148	0.52182	52.1818	32nd
33	**E3**	105	121	100	71	43	1146	0.52091	52.0909	33rd
34	**P2**	81	113	162	52	17	1086	0.49364	49.3636	34th
35	**P1**	136	110	90	61	43	1085	0.49318	49.3182	35th
36	**E5**	155	124	70	52	39	1016	0.46182	46.1818	36th
37	**E6**	142	130	100	36	32	1006	0.45727	45.7273	37th
38	**P3**	156	122	90	40	31	985	0.44773	44.7727	38th
39	**P4**	180	107	92	35	26	940	0.42727	42.7273	39th

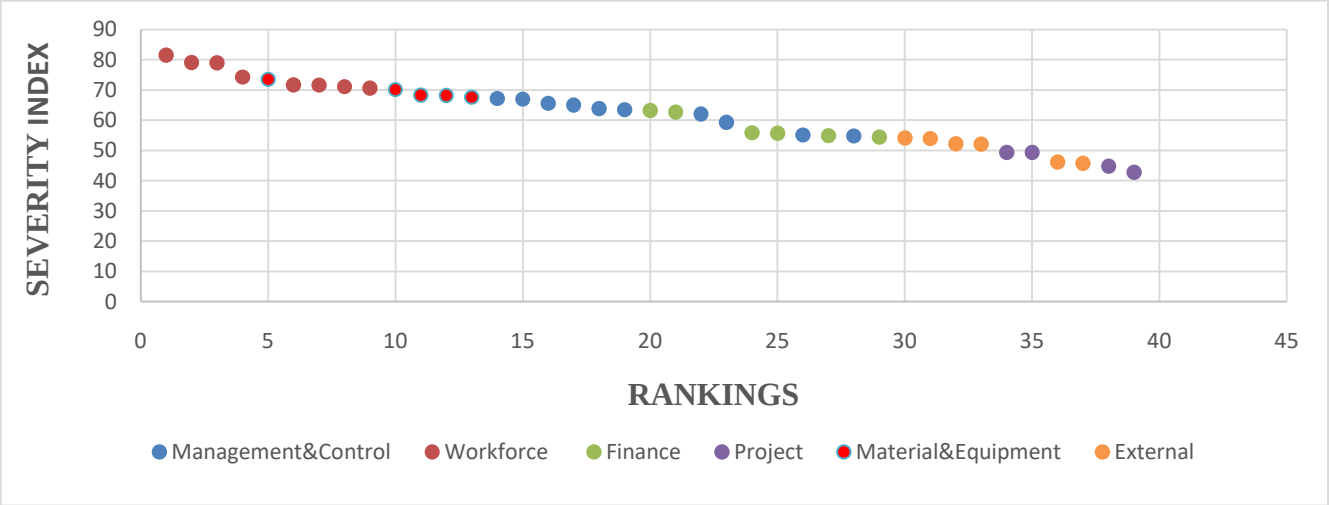

Figure 5: Scatter Chart showing the Responses Factor Ratingsfor Project Quality.

From Figure 5, workforce factors was ranked highest influencer of labour productivity followed by the material and equipment. This showed how important the quality of the workforce and the quality of materials and equipment is towards enhancing labor productivity to good project quality. This

also confirms the accuracy of the correlation results for project quality as these two factors showed the highest correlation with one another. The least two ranked factors were External & Project with the former ranked the least.

5.0 CONCLUSION

The most ranked labour productivity factor was the management factor for both cost overrun and project delay while it was workforce for the quality. It showed how influential the level of experience of the management and the level of skills and intellect of the workforce is to ensuring and driving optimal productivity in all execution of the construction project deliverables

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