An Assessment of Labour Productivity Influencing Factors in the Construction Industry: A Case study of Zaria, Nigeria

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Abstract
In this research, factors influencing construction labour productivity in Zaria, Nigeria was assessed. The aim of the research was to identify these factors and rank them according to their severity. This information will aid site managers and the construction professionals on decisions to take in order to limit these controlling factors thereby leading to an improved level of efficiency in labour force, increase product labour productivity and reduce cost and time over runs on construction projects. The research adopted a quantitative research approach with the use of questionnaires as an instrument for data collection from site managers at construction sites in Zaria. The Questionnaire sought to assess the perception of site managers on factors affecting construction labour productivity. Thirty-Nine out of the Forty-One factors researched indicated high severity with the RII ranging between 0.60 ≤ RII < 0.80. The research revealed that external forces tend to affect construction labour productivity more than site factors and human labour factors. This can be attributed to the fact that the site engineers can control site factors and human labour factors while the external factors cannot be really controlled by the site engineers. The survey also revealed that rain, conflict with project stakeholders, skill of labour, and financial crisis had a very high severity in affecting construction labour productivity on the construction sites.

Keywords: Construction Labour Productivity, Perception, Severity, Relative Importance Index (RII), Construction Industry, Nigeria.

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I. INTRODUCTION

The Nigerian construction industry is be-devilled with issues ranging from corruption during the award of contracts, to the total neglect of projects due to cash flow problems. As a result, construction workers have been subjected to a work environment which does not encourage high levels of efficiency. The non-payment or delay of wages/salaries, the disruption of work due to lack of materials or tools, and the resulting loss of morale have led to an exodus of traditional craftsmen from the industry [1]. Attar, et al. [2] noted that construction is a key sector of the national economy for countries all around the world, as traditionally it takes up a big portion in the nation’s total employment and its significant contribution to a nation’s revenue as a whole. One of the main factors as noted by Khaled and Remon [3] influencing the construction industry growth is productivity and it is mainly associated with the labour performance. According to Bekr [4], Construction Labour productivity can be said to be the units of work produced or placed in an hour.

At low levels, CLP can be dangerous causing social conflicts to a Nation’s economy[5, 6]. Identification of these factors affecting productivity levels is important, as it will aid site handlers in tackling such problems thereby reducing time and cost overruns [7, 8]. It will also help to improve labour productivity at the sites [9]. The construction industry’s productivity is vital considering the enormous effect it has on a Nation’s GDP [10]. An improved productivity means a rise in GDP.

This research identifies various labour productivity factors, analyse them statistically, assess the difference in perception between the various professionals in construction and finally looks at its findings in line with other previous studies.
II. LITERATURE REVIEW

The construction industry in Nigeria is a very dynamic one. Over the last few years, impressive numbers have been recorded. The industry is heavily dependent on government expenditure, that’s why the industry is growing at the same time with government revenue [11]. Jobs have been created with a great potential of expansion due to the labour intensiveness of construction industry and the ever increasing demand for services in the sector [12].

A. Concept and Characteristics of Labour

Abdullahi [13] defined labour as a term referring to all physical and mental work undertaken for monetary rewards. Amadeo [14] defined labour as the quantity of physical, mental and social effort used to produce goods and services. He classified labour into that based on skill level and that based on relationship with the employer. Based on skill level, labour is classified into Unskilled, semi-skilled and skilled labour. While classifying labour based on relationship is grouped into wage labour and contract labour.

According to Smriti [15] labour is perishable, it cannot be separated from the labourer, it is inelastic in supply, has differences in its efficiency and estimating its production cost is difficult.

Kale and Doguwa [16] describe total labour force as comprising of the working age population that are either employed or unemployed. These are individuals within the ages 15 and older (64 years in the case of Nigeria).

B. Labour Productivity

Productivity refers to the output generated from a system and the input used to create output. It is expressed as:

\[
\text{Productivity} = \frac{\text{Output}}{\text{Input}} \quad (2.1)
\]

\[
\text{Labour Productivity} = \frac{\text{Output}}{\text{Labour cost}} \quad (2.2)
\]

or

\[
\text{Labour Productivity} = \frac{\text{Output}}{\text{Work hour}} \quad (2.3)
\]

1) Average Labour Productivity (ALP)

Average Labour Productivity ALP looks at the impact of one factor input (labour). Its main limitation is that as a single factor measure it cannot be used for analysis of total productivity performance [17]. According to Merrow, et al. [18], there are three approaches to measuring average labour productivity. The economist approach, the construction manager’s approach and the project approach.

2) Total Factor Productivity (TFP)

According to [19], Total Factor Productivity (TFP) is the most widely used measure of productivity. Total factor productivity is the ratio of aggregated inputs to aggregated outputs Kendrick [20]. It’s main disadvantage however, is that it allows little room for differentiating the influence of factors that can be controlled internally from those that are imposed externally.

C. Benefits of Productivity Management

According to Edosomwan [21] management of productivity enables the consumer to pay low prices for goods and services, ensure the effective utilisation of resources. Other benefits includes providing the basis for higher incomes for employees, providing an organisation with the strength to deal with internal operating weakness and external competition, enable an organisation to be more profitable and enable the public realise greater social benefits.

Other benefits as outlined by Eilon et al (1976) include:

- For strategic purposes: to compare the performance of the company with that of its competitors of related firms,
- For tactical purposes: to regulate the performance of the firm
- For planning purposes: as the basis for considering alternative adjustments over future periods.
- For other management purposes: such as collective bargaining with trade unions.

D. Factors affecting Construction Labour Productivity in Nigeria

Odesola, et al. [22] in a research carried out in Bayelsa, Nigeria, assessed using questionnaire identified 18 factors that ranked according to their importance. These were, specification and standardisation as the most important while stoppage due to disputes was the least important. Edwin and Calistus [23] carried out a survey using questionnaires in carpentry and steel fixing in North-central Nigeria. A total of 21 factors were identified with design shape and size as the most important while labour personal problems was ranked as the least important. Odesola [24] carried out a research in Cross River, Nigeria. Thirty-one (31) factors were identified in the research.

Material management was ranked the most important while lack of big picture view on behalf of the crafts was ranked the least. Olomolaiye, et al. [1] were among the first researchers on productivity in Nigeria. They carried out an assessment using activity sampling and questionnaire surveys. Eight (8) problems influencing craftsmen’s productivity were identified in the research with lack of materials been ranked as the most important and changing of crew members was ranked the least important. Odesola and Idoro [25] carried out a study which covered the six geographical states in Nigeria’s south-south geopolitical zone structured questionnaires. Fifteen (15) factors were identified in the research and ranked according to their level of importance. Craft workers’ pride was ranked the most important and lack of competition was ranked the least.

E. Factors Influencing Construction Labour Productivity in other Countries

Khaled and Remon [3] in a research carried out in Egypt assessed thirty (30) factors which were ranked according to their level of importance. Enshassi, et al. [26] in a research carried in the Gaza strip assessed Forty-five (45) factors with the use of questionnaires. The factor ranked as the most
important was material shortages while the least important was noise. Thomas and Sudhakumar [27] carried out a survey with the use of questionnaires in India. Forty-three (43) factors were assessed. Unavailability of material on time at workplace was ranked the most important while excessive overtime was ranked the least. Jarkas and Bitar [28] assessed Forty-five (45) factors in a research in Kuwait. Clarity of technical specifications was the most important while rain was ranked the least important. Makulsawatudom and Emsley [29] in Thailand assessed Twenty-three (23) factors. The most important factor was lack of material while work shift was ranked the least. Hickson and Ellis [30] in a study in Trinidad and Tobago assessed forty-two (42) factors in their research. The most important factor was lack of labour supervision, unsuitability of storage location was ranked the least. Gundecha [31] used questionnaires sent by email to various professionals. Forty (40) factors were assessed in the study. The most important factor was lack of required construction material, while personal problems was ranked the least important.

III. RESEARCH METHOD

The quantitative approach was used. Method of data collection was literature review and structured questionnaire. The population frame of this research are site managers on Sixty-nine (69) active construction sites within Zaria.

1) Sampling method

A non-probability sampling method known as purposive sampling was used for the research. Kish’s Formula was used for calculating sample size

\[ n = \frac{n_1}{1+\left(\frac{n_1}{N}\right)} \]  

(3.1)

Where \( n \) = Sample size

\[ n_1 = \frac{s^2}{\bar{y}^2} \]  

(3.2)

\( N \) = Population size

\( V \) = Standard error of sampling distribution = 0.05

\( S^2 \) = \( P(1-P) = (0.5)(0.5) = 0.25 \)

\( P \) = the proportion of standard deviation in the population element (total error = 0.1 at 95% confidence level).

\[ n_1 = \frac{0.25}{0.0025} = 100 \]  

(3.4)

Substituting in equation 3.1;

\[ n = \frac{100}{1+\left(\frac{100}{69}\right)} \]  

(3.5)

\[ n = 41 \]

2) Sampling method

Statistical Package for Social Sciences (SPSS) was used to get frequency table which in turn was used to analyse the respondents’ general information. The factors affecting construction was analysed using frequency tables and a Kruskal Wallis Test was done to determine the difference in perception between the various professions. Relative importance index (RII) and Item Mean was used to rank the factors according to their significance. The RII and Item Mean was done using a programmed Microsoft Excel Sheet and the formula used was

\[ RII = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5[n_5 + n_4 + n_3 + n_2 + n_1]} \]

\[ Mean = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{Total\ respondents} \]

Where \( n_5 \) = Frequency of “Strongly Agree” response

\( n_4 \) = Frequency of “Agree” response

\( n_3 \) = Frequency of “Neutral” response

\( n_2 \) = Frequency of “Disagree” response

\( n_1 \) = Frequency of “Strongly Disagree” response

An RII < 0.60 indicates low severity of the factor; 0.60 < RII < 0.80 indicates high severity, An RII ≥ 0.80 indicates a very high severity of the factor.

Factors used for analysis were divided into three groups as adopted by Hickson and Ellis [30]. Each factor was given a serial number according to the group it belongs. Table 3.1, Table 3.2 and Table 3.3 shows the factors in their various groupings with their serial number.

| TABLE 3.1: SITE FACTORS |
|-------------------------|
| A Site Factors          |
| A1 Delay in responding to request for information |
| A2 Rework              |
| A3 Amount of variation/change of orders during execution |
| A4 Clarity of technical specification |
| A5 Level of co-ordination among design disciplines i.e. Architects, Engineers, etc. |
| A6 Compatibility and consistency among contract document |
| A7 Strict inspection by the engineer |
| A8 Complexity of the design and project |
| A9 Restricted access on site |
| A10 Inspection delay by the engineer |
| A11 Confinement of working space |
| A12 Site layout |
| A13 Mobilization/Demobilization |
| A14 Hazardous Work Area |
| A15 Excessive labour/Over-manning |
| A16 Lack of places for eating and relaxation |
| A17 Non provision of transport means for workers |

| TABLE 3.2: HUMAN LABOUR FACTORS |
|----------------------------------|
| B Human Labour Factors          |
| B1 Shortage of experienced labour |
| B2 Skill of labour              |
| B3 Lack of competition/motivation of labour |
| B4 Physical fatigue             |
| B5 Craft workers’ pride in their work |
| B6 Labour disloyalty            |
| B7 Labour dissatisfaction       |
| B8 Increase of labourer’s age   |
| B9 Drug abuse and alcoholism    |
| B10 Labour absenteeism          |
| B11 Poor health of workers      |
| B12 Labour personal problems    |
| B13 Poor economic condition of workers |
| B14 Literacy level              |

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### TABLE 3.3: EXTERNAL FACTORS

| C | External Factors                                      |
|---|-------------------------------------------------------|
| C1| Rain                                                  |
| C2| High Temperature                                      |
| C3| Weather and Season Changes                            |
| C4| Government policies                                   |
| C5| Cultural conditions and customs of the community at the project site |
| C6| Religious holidays/other holidays                     |
| C7| Rise in fuel prices                                   |
| C8| Environmental pollution                               |
| C9| Conflict with project stakeholders                    |
| C10|Financial Crisis                                      |

### IV. DATA PRESENTATION AND DISCUSSION

#### TABLE 4.1 RETURN RATE OF QUESTIONNAIRE

|                  | Frequency | Percent |
|------------------|-----------|---------|
| Not-Returned     | 26        | 39      |
| Returned         | 41        | 61      |
| Distributed      | 67        | 100     |

#### TABLE 4.2: RESPONDENTS’ YEARS OF EXPERIENCE

| Years           | Frequency | Percent |
|-----------------|-----------|---------|
| Less than 5     | 6         | 14.6    |
| 5-10            | 18        | 43.9    |
| 11-15           | 10        | 24.4    |
| More than 15    | 7         | 17.1    |
| Total           | 41        | 100.0   |

#### TABLE 4.3: RESPONDENTS’ QUALIFICATION

|                         | Frequency | Percent |
|-------------------------|-----------|---------|
| Diploma                 | 3         | 7.3     |
| HND                     | 9         | 22.0    |
| BSc/BEng                | 13        | 31.7    |
| MSc                     | 10        | 24.4    |
| PhD                     | 1         | 2.4     |
| Others                  | 5         | 12.2    |
| Total                   | 41        | 100.0   |

#### TABLE 4.4 PROFESSION IN THE CONSTRUCTION INDUSTRY

|                         | Frequency | Percent |
|-------------------------|-----------|---------|
| Architect               | 3         | 7.3     |
| Builder                 | 11        | 26.8    |
| Quantity Surveyor       | 5         | 12.2    |
| Engineer                | 14        | 34.1    |
| Project Manager         | 1         | 2.4     |
| Craftsman               | 2         | 4.9     |
| Others                  | 5         | 12.2    |
| Total                   | 41        | 100.0   |

#### TABLE 4.5 SIZE OF THE ORGANIZATION

|                  | Frequency | Percent |
|------------------|-----------|---------|
| Small            | 8         | 19.5    |
| Medium           | 19        | 46.3    |
| Large            | 14        | 34.1    |
| Total            | 41        | 100.0   |

Table 4.1 shows the return rate of response. Sixty-seven questionnaires were distributed. Forty-one questionnaires were returned while Twenty-six were not, indicating a return rate of 61%.

Table 4.2 shows the years of respondent’s experience. More than 50% of the respondents had at least 5 years of professional experience.

Table 4.3 shows that more than half of the respondents have a qualification of B.Sc/B.Eng or above.

Table 4.4 shows that Engineers and Builders made above half of the respondents while table 4.5 shows that the medium sized companies had the highest percentage of respondents.

The characteristics listed above indicate that the respondents possess the requisite knowledge and experience to provide reliable information on which reliable conclusions can be made.

Table 4.6, 4.7 and 4.8 show the ranking of site factors, human labour factors and external factors while table 4.9 shows the overall ranking of all the factors. It shows rain, conflict with project stakeholders, skill of labour, financial crisis and government policies the topmost severity.
### Table 4.6: Ranking of Site Factors

| S/N | Site Factors                                                                 | RII | Mean | Rank | Grank |
|-----|-----------------------------------------------------------------------------|-----|------|------|-------|
| A14 | Hazardous Work Area                                                         | 0.790 | 3.950 | 06   | 01    |
| A3  | Amount of variation/change of orders during execution                       | 0.766 | 3.829 | 08   | 02    |
| A5  | Level of co-ordination among design disciplines i.e. Architects, Engineers, etc. | 0.756 | 3.780 | 10   | 03    |
| A6  | Compatibility and consistency among contract document                        | 0.756 | 3.780 | 11   | 04    |
| A4  | Clarity of technical specification                                           | 0.714 | 3.568 | 17   | 05    |
| A13 | Mobilization/Demobilization                                                  | 0.713 | 3.564 | 18   | 06    |
| A2  | Rework                                                                      | 0.705 | 3.525 | 20   | 07    |
| A1  | Delay in responding to request for information                               | 0.695 | 3.475 | 21   | 08    |
| A8  | Complexity of the design and project                                         | 0.693 | 3.463 | 22   | 09    |
| A12 | Site layout                                                                  | 0.690 | 3.450 | 23   | 10    |
| A7  | Strict inspection by the engineer                                            | 0.663 | 3.317 | 26   | 11    |
| A10 | Inspection delay by the engineer                                             | 0.663 | 3.317 | 27   | 12    |
| A9  | Restricted access on site                                                    | 0.659 | 3.293 | 30   | 13    |
| A11 | Confinement of working space                                                 | 0.655 | 3.275 | 31   | 14    |
| A17 | Non provision of transport means for workers                                 | 0.652 | 3.261 | 32   | 15    |
| A15 | Excessive labour/Over-manning                                               | 0.610 | 3.051 | 37   | 16    |
| A16 | Lack of places for eating and relaxation                                     | 0.590 | 2.951 | 40   | 17    |

### Table 4.7: Ranking of Human Labour Factors

| S/N | Human Labour factors                      | RII | Mean | Rank | Grank |
|-----|-------------------------------------------|-----|------|------|-------|
| B2  | Skill of labour                           | 0.800 | 4.000 | 03   | 01    |
| B1  | Shortage of experienced labour            | 0.765 | 3.825 | 09   | 02    |
| B13 | Poor economic condition of workers        | 0.749 | 3.744 | 12   | 03    |
| B3  | Lack of competition /motivation of labour | 0.740 | 3.700 | 13   | 04    |
| B4  | Physical fatigue                          | 0.740 | 3.700 | 14   | 05    |
| B11 | Poor health of workers                    | 0.718 | 3.590 | 16   | 06    |
| B14 | Literacy level                            | 0.708 | 3.542 | 19   | 07    |
| B7  | Labour dissatisfaction                     | 0.662 | 3.308 | 28   | 08    |
| B10 | Labour absenteeism                        | 0.662 | 3.308 | 29   | 09    |
| B6  | Labour disloyalty                         | 0.651 | 3.256 | 33   | 10    |
| B9  | Drug abuse and alcoholism                 | 0.631 | 3.154 | 36   | 11    |
| B12 | Labour personal problems                 | 0.605 | 3.027 | 38   | 12    |
| B5  | Craft workers' pride in their work        | 0.605 | 3.026 | 39   | 13    |
| B8  | Increase of labourer’s age                | 0.537 | 2.684 | 41   | 14    |

### Table 4.8: Ranking of External Factors

| External Factors                              | RII | Mean | Rank | Grank |
|-----------------------------------------------|-----|------|------|-------|
| C1 Rain                                       | 0.840 | 4.200 | 01   | 01    |
| C9 Conflict with project stakeholders         | 0.810 | 4.050 | 02   | 02    |
| C10 Financial Crisis                          | 0.800 | 4.000 | 04   | 03    |
| C4 Government polices                         | 0.795 | 3.975 | 05   | 04    |
| C5 Cultural conditions and customs of the community at the project site | 0.770 | 3.850 | 07   | 05    |
| C8 Environmental pollution                    | 0.735 | 3.675 | 15   | 06    |
| C2 High Temperature                           | 0.685 | 3.425 | 24   | 07    |
| C3 Weather and Season Changes                 | 0.685 | 3.425 | 25   | 08    |
| C6 Religious holidays/other holidays          | 0.650 | 3.250 | 34   | 09    |
| C7 Rise in fuel prices                        | 0.645 | 3.225 | 35   | 10    |
| S/N | Factors                                                                 | Frequency of degree of importance by respondents | N   | RII  | Mean | R   |
|-----|------------------------------------------------------------------------|-----------------------------------------------|-----|------|------|-----|
|     |                                                                        | 5    | 4    | 3    | 2    | 1   |     |     |
| C1  | Rain                                                                   | 17   | 15   | 7    | 1    | 0   | 40  | 0.840 | 4.20 | 01  |
| C9  | Conflict with project stakeholders                                     | 12   | 23   | 1    | 3    | 1   | 40  | 0.810 | 4.05 | 02  |
| B2  | Skill of labour                                                        | 8    | 25   | 4    | 2    | 0   | 39  | 0.800 | 4.00 | 03  |
| C10 | Financial Crisis                                                       | 11   | 22   | 4    | 2    | 1   | 40  | 0.800 | 4.00 | 04  |
| C4  | Government policies                                                    | 12   | 17   | 9    | 2    | 0   | 40  | 0.795 | 3.97 | 05  |
| A14 | Hazardous Work Area                                                   | 10   | 21   | 6    | 3    | 0   | 40  | 0.790 | 3.95 | 06  |
| C5  | Cultural conditions and customs of the community at the project site   | 8    | 22   | 7    | 2    | 1   | 40  | 0.770 | 3.85 | 07  |
| A3  | Amount of variation/change of orders during execution                  | 11   | 20   | 3    | 6    | 1   | 41  | 0.766 | 3.83 | 08  |
| B1  | Shortage of experienced labour                                        | 11   | 20   | 1    | 7    | 1   | 40  | 0.765 | 3.83 | 09  |
| A5  | Level of co-ordination among design disciplines i.e. Architects, Engineers, etc. | 11   | 21   | 2    | 3    | 4   | 41  | 0.756 | 3.78 | 10  |
| A6  | Compatibility and consistency among contract document                  | 9    | 22   | 5    | 2    | 3   | 41  | 0.756 | 3.78 | 11  |
| B13 | Poor economic condition of workers                                     | 8    | 19   | 7    | 4    | 1   | 39  | 0.749 | 3.74 | 12  |
| B3  | Lack of competition/motivation of labour                              | 5    | 24   | 5    | 6    | 0   | 40  | 0.740 | 3.70 | 13  |
| B4  | Physical fatigue                                                       | 7    | 22   | 4    | 6    | 1   | 40  | 0.740 | 3.70 | 14  |
| C8  | Environmental pollution                                               | 7    | 17   | 12   | 4    | 0   | 40  | 0.735 | 3.68 | 15  |
| B11 | Poor health of workers                                                | 9    | 15   | 7    | 6    | 2   | 39  | 0.718 | 3.59 | 16  |
| A4  | Clarity of technical specification                                     | 8    | 16   | 4    | 7    | 2   | 37  | 0.714 | 3.57 | 17  |
| A13 | Mobilization/Demobilization                                           | 8    | 14   | 9    | 8    | 0   | 39  | 0.713 | 3.56 | 18  |
| B14 | Literacy level                                                         | 4    | 12   | 4    | 1    | 3   | 24  | 0.708 | 3.54 | 19  |
| A2  | Rework                                                                 | 2    | 23   | 10   | 4    | 1   | 40  | 0.705 | 3.53 | 20  |
| A1  | Delay in responding to request for information                         | 7    | 17   | 8    | 4    | 4   | 40  | 0.695 | 3.48 | 21  |
| A8  | Complexity of the design and project                                  | 7    | 16   | 8    | 9    | 1   | 41  | 0.693 | 3.46 | 22  |
| A12 | Site layout                                                            | 7    | 17   | 7    | 5    | 4   | 40  | 0.690 | 3.45 | 23  |
| C2  | High Temperature                                                       | 9    | 13   | 8    | 6    | 4   | 40  | 0.685 | 3.43 | 24  |
| C3  | Weather and Season Changes                                             | 4    | 18   | 10   | 7    | 1   | 40  | 0.685 | 3.43 | 25  |
| A7  | Strict inspection by the engineer                                      | 11   | 8    | 7    | 13   | 2   | 41  | 0.663 | 3.32 | 26  |
| A10 | Inspection delay by the engineer                                      | 6    | 16   | 9    | 5    | 5   | 41  | 0.663 | 3.32 | 27  |
| B7  | Labour dissatisfaction                                                 | 7    | 12   | 10   | 6    | 4   | 39  | 0.662 | 3.31 | 28  |
| B10 | Labour absenteeism                                                     | 8    | 11   | 8    | 9    | 3   | 39  | 0.662 | 3.31 | 29  |
| A9  | Restricted access on site                                             | 3    | 22   | 6    | 4    | 6   | 41  | 0.659 | 3.29 | 30  |
| A11 | Confinement of working space                                          | 1    | 22   | 6    | 9    | 2   | 40  | 0.655 | 3.28 | 31  |
| A17 | Non provision of transport means for workers                           | 2    | 8    | 9    | 2    | 2   | 23  | 0.652 | 3.26 | 32  |
| B6  | Labour disloyalty                                                      | 5    | 15   | 7    | 9    | 3   | 39  | 0.651 | 3.25 | 33  |
| C6  | Religious holidays/other holidays                                      | 5    | 15   | 10   | 5    | 5   | 40  | 0.650 | 3.25 | 34  |
| C7  | Rise in fuel prices                                                    | 8    | 8    | 12   | 9    | 3   | 40  | 0.645 | 3.23 | 35  |
| B9  | Drug abuse and alcoholism                                              | 7    | 12   | 7    | 6    | 7   | 39  | 0.631 | 3.15 | 36  |
| A15 | Excessive labour/Over-manning                                         | 2    | 16   | 6    | 12   | 3   | 39  | 0.610 | 3.05 | 37  |
| B12 | Labour personal problems                                              | 3    | 11   | 12   | 6    | 5   | 37  | 0.605 | 3.03 | 38  |
| B5  | Craft workers' pride in their work                                     | 3    | 12   | 9    | 11   | 3   | 38  | 0.605 | 3.03 | 39  |
| A16 | Lack of places for eating and relaxation                              | 6    | 13   | 5    | 7    | 1   | 41  | 0.590 | 2.95 | 40  |
| B8  | Increase of labour’s age                                               | 4    | 7    | 7    | 13   | 7   | 38  | 0.537 | 2.68 | 41  |

5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree, N= Total Respondents, R=Rank
Fig. 4.1: Cluster diagram showing the Relative Importance Index (RII) of the Construction Industry Professionals (Architects, Builders, Engineers & Quantity Surveyors)
Fig. 4.2: Cluster diagram showing the Relative Importance Index (RII) of Large, Medium and Small companies

Relative Importance Index
Table 4.10: Ranking for group of factors

| Group Code | Group         | Average RII | Rank |
|------------|---------------|-------------|------|
| C          | External Factor | 0.741       | 1    |
| A          | Site Factors   | 0.692       | 2    |
| B          | Human Labour Factors | 0.684 | 3    |

Table 4.10 shows that external factors, site and human factors ranked first, second and third. This indicates that environment of work and external factors have more affect on productivity than human labour factors.

Table 4.11: Kruskal Wallis Test Results

| Factors                                           | Kruskal-Wallis H | Asymp. Sig. | Difference in perception |
|---------------------------------------------------|------------------|-------------|-------------------------|
| Delay in responding to request for information    | 3.646            | 0.302       | Significant              |
| Rework                                            | 3.722            | 0.293       | Significant              |
| Amount of variation/change of orders during execution | 3.168            | 0.366       | Significant              |
| Clarity of technical specification                | 2.490            | 0.477       | Significant              |
| Level of co-ordination among design disciplines i.e. Architects, Engineers, etc. | 2.521            | 0.471       | Significant              |
| Compatibility and consistency among contract document | 3.978            | 0.264       | Significant              |
| Strict inspection by the engineer                 | 1.892            | 0.595       | Significant              |
| Complexity of the design and project             | 3.987            | 0.263       | Significant              |
| Restricted access on site                         | 4.429            | 0.219       | Significant              |
| Inspection delay by the engineer                  | 1.270            | 0.736       | Significant              |
| Confinement of working space                      | 1.137            | 0.768       | Significant              |
| Site layout                                       | 3.068            | 0.381       | Significant              |
| Mobilization/Demobilization                       | 1.059            | 0.787       | Significant              |
| Hazardous Work Area                               | 4.051            | 0.256       | Significant              |
| Excessive labour/Over-manning                     | 5.103            | 0.164       | Significant              |
| Lack of places for eating and relaxation          | 1.418            | 0.701       | Significant              |
| Non provision of transport means for workers      | 3.878            | 0.275       | Significant              |
| Shortage of experienced labour                    | 2.763            | 0.430       | Significant              |
| Skill of labour                                   | 2.355            | 0.502       | Significant              |
| Lack of competition/motivation of labour          | 5.770            | 0.123       | Significant              |
| Physical fatigue                                  | 6.472            | 0.091       | Significant              |
| Craft workers' pride in their work                | 0.894            | 0.827       | Significant              |
| Labour disloyalty                                 | 4.139            | 0.247       | Significant              |
| Labour dissatisfaction                            | 3.139            | 0.371       | Significant              |
| Increase of labourer’s age                        | 1.575            | 0.665       | Significant              |
| Drug abuse and alcoholism                         | 2.796            | 0.424       | Significant              |
| Labour absenteeism                                | 1.270            | 0.736       | Significant              |
| Poor health of workers                            | 4.231            | 0.238       | Significant              |
| Labour personal problems                          | 8.177            | 0.042       | Not Significant          |
| Poor economic condition of workers                | 2.951            | 0.399       | Significant              |
| Literacy level                                    | 2.918            | 0.404       | Significant              |
| Rain                                              | 8.578            | 0.035       | Not Significant          |
| High Temperature                                  | 4.183            | 0.242       | Significant              |
| Weather and Season Changes                        | 4.946            | 0.176       | Significant              |
| Government polices                                | 0.354            | 0.950       | Significant              |
| Cultural conditions and customs of the community at the project site | 2.548            | 0.467       | Significant              |
| Religious holidays/other holidays                 | 4.734            | 0.192       | Significant              |
| Rise in fuel prices                               | 0.575            | 0.902       | Significant              |
| Environmental pollution                           | 0.811            | 0.847       | Significant              |
| Conflict with project stakeholders                | 7.319            | 0.062       | Significant              |
| Financial Crisis                                  | 14.114           | 0.003       | Not Significant          |

Table 4.11 shows the difference in perception between Architect, Builders, Engineers and Quantity Surveyors. The Kruskal Wallis test showed that there was significant difference in perception of the various professionals of thirty-eight factors with p-value ranging from 0.062 to 0.902. However, no significant difference was observed for three factors. These factors are rain, economic crises and labour personal problems.
Results represented on Table 4.12 indicates that the factors influencing construction productivity depends on the geographical locations. Climatic conditions, method of construction, material use, availability and technological application as well as contractual procedures are some of the causative agents Gundecha [31]. However, a common factor across most regions and countries is the skill of labour. It ranks third in this research, second in south-south Nigeria, fifth in Trinidad and Tobago, and first in Egypt.
V. CONCLUSION AND RECOMMENDATIONS

An assessment of factors in the construction industry influencing labour productivity in Zaria, Northwestern Nigeria was carried out. The following findings were obtained from the survey.

- The research shows that productivity of labour in the area considered is seriously affected as thirty-nine of the forty-one identified factors indicated high severity.
- Rain, conflict with project stakeholders, and skill of labour ranked first, second and third respectively in the level of severity.
- Architects, Builders, Engineers and Quantity Surveyors all have different perception on the factors affecting construction except for rain, financial crisis and labour personal problems.
- Architects viewed literacy level to be the most important factor, Builders viewed conflict with project stakeholders, Engineers viewed financial crisis to be the most important factor, while Quantity Surveyors viewed physical fatigue to be the most important factor.
- There exists a difference in significance of the factors across the regions and countries except for labourer’s skill that ranked third in this research, second in south-south Nigeria, fifth in Trinidad and Tobago, and first in Egypt.
- External factors tend to affect construction labour productivity more than site and human labour factors. This is mostly due to the fact that site and human labour factors can be controlled to some extent by the site engineers but external factors can’t really be controlled by the site engineers.

Professionals, especially those managing construction sites should pay more attention to controlling these factors to enhance more productivity on their sites. It is suggested that further studies be carried out on the level of influence these factors have on the productivity of labour.

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