Journal of Biodiversity and Environmental Research
April, 2026 Editions
www.ssaapublications.com

JBER
Vol.12, No.4, E-ISSN 3027-1916
P-ISSN 3026-9466
Sahara African Academic

ASSESSMENT OF SELECTED DEMOGRAPHIC FACTORS ON THE OUTPUT OF MASONS IN ABUJA

MAKINDE JOSEPH KOLAWOLE; & YAHAYA ALIYU
Department of Project Management, Federal University of Technology, Minna, Niger State.
Corresponding Author: josyk@futminna.edu.ng
DOI: https://doi.org/10.70382/sjber.v12i4.062

ABSTRACT
The systemic reduction in the productivity of workers on the construction sites had been a major concern to construction stakeholders. This decrease in the productivity level among the artisans has led in some cases to the budget overruns and project delay. The aim of the paper is to assess the effects of demographic factors such as wages, location of works and weather on the output of selected masons in FCT, Abuja. The objectives are (i) to identify the common demographic factors affecting the masons; (ii) to examine the effects of these factors on the output of masons and (iii) to proffer useful suggestions to construction stakeholders on how to mitigate the effect of these factors. Quantitative research method was adopted whereby data for the study were collected through purposive sampling of construction sites in randomly selected three districts in Abuja Metropolis. 75 structured questionnaires were administered to the masons that were randomly selected. In addition, stop clock and thermometer to measure the temperature during the morning and afternoon sessions. Data collected were subjected to regression analysis to determine the relationship between the demographic factors and the outputs of mason tested. The results of the findings show that wages paid to masons working in the substructural section of residential buildings in relation to the output has a Coefficient of determination (R^2) of 2% whereas, the depth of work has (R^2) of 43.9%. it is then concluded that location of works in the substructure (depth) has a significant relationship with the output of mason while wages of masons may be influenced by other factors.

KEYWORDS: Demographic factors, wages, output, weather, substructure

INTRODUCTION

Organizational productivity is a determining factor in the efficiency, competitiveness and sustainability of companies. Its optimization not only impacts profitability and business growth, but also influences employment generation, innovation and economic development. Productivity is affected by multiple factors, including human talent management, the adoption of innovative technologies, organizational culture and strategic leadership (Eliseo-Dantés et al., 2025)

Despite the fact that technology has improved, the construction industry is still not as productive as it could be because of problems with managing workers, making sure they are happy with their jobs, their skills, and problems at the job site. The construction industry depends on workers, and the efficiency of those workers decides the success of a project (Sharma, 2025). Globally, the most preferred definition of labour productivity is 'earned value over the actual cost'. However, there are regional discrepancies especially in Nigeria where 'output per worker hour' is the most accepted definition as well as in the Americas. It is crucial to understand the factors that influence construction productivity, such as construction materials, skilled workforce, technology adoption, and the use of digital tools. Understanding these elements can guide the sector towards effective productivity improvement (RICS, 2023). Fadel (2025) explained that many construction projects suffer low productivity and for the past 20 years, productivity in this sector has grown only by 1% and that is quite low compared with the 2.8 percent growth of the entire world economy and 3.6% growth for the manufacturing sector.

STATEMENT OF THE PROBLEM

Measuring productivity among workers on construction sites in Nigeria has been a herculean task, especially when considering what is the average output expected from an operative per hour, what is the revenue expected per an operative and what is the cost per unit of output from an operative? These and many more are the problems faced by the construction stakeholders. The influence of demographic factors such as wages, site temperatures, point/position of works and material distances on the outputs expected from site operatives cannot be overlooked.

AIM

The aim of the study is to assess the effect of demographic factors on the output of masons in Nigerian construction sites.

OBJECTIVES

The three objectives for this paper are -:

(i) To identify demographic factors affecting masons on Nigerian construction sites;

(ii) To determine the effect of these demographic factors on the output of masons;

(iii) To determine the relationship that exist between these demographic factors and the output of the masons on sites

LITERATURE REVIEW

The construction industry has long struggled with productivity issues, often lagging behind other sectors. During the year 2007-2019, productivity in residential buildings actually trended downward as well as road and highway construction as noted by US Bureau of Labour Statistics (2025). In Nigeria, the same observation was noted by many construction stakeholders as percentage of public residential and infrastructural projects are dwindling due to economic recession, loss of moral among workers in workplace and political instability. According to Tell and Frisa (2026), construction productivity is the measure of output achieved in relation to the input resources used in construction projects. This includes the efficiency with which labour, materials and equipment are used to complete tasks within a project. High productivity levels enable projects to be completed more quickly and with fever resources, resulting in cost savings and increased profitability. Conversely, low productivity can result in delays, increased costs and potentially compromised quality.

According to RICS (2023), low productivity affects construction projects negatively in many ways. One of the main outcomes is that firm can't remain competitive. This means that competitors will always be ahead in terms of the contracts won and the profits gottten. For that reason, improving efficiency should be a top priority for contractors and subcontractors. In the Nigerian construction industry, productivity is a measure of how cost-effective and time-efficient the project is. This is the ratio of input versus output. An example is the amount of concrete poured in one hour by one worker. Or the number of bricks laid per day by a team of masons.

A number of metrics come into play when analyzing construction productivity. The key metrics include:

(i) **Costs:** The total amount of money invested in the project, including direct costs like labour and materials and indirect costs like equipment depreciation and administration.

(ii) **Labor input:** This measures the amount of human work needed for a project. It can be measured in hours or labour days. It shows the size of the workforce and how much effort they use to complete a project.

(iii) **Material input:** This measures the amount of raw materials used for construction, such as ballast, sand, cement, water, or rebars. It can be measured in units like pieces, tons, or cubic yards, depending on the type of material.

(iv) **Capital input:** The amount of money invested in the equipment and technology used at the construction site. It includes the purchase and maintenance cost of machinery and tools.
(v) **Energy input:** This measures the amount of energy used during the construction project, usually calculated in kilowatt-hours or British thermal units (BTUs). It includes electricity and fuel.
(vi) **Indirect costs:** This includes expenses that are not directly tied to the physical construction but are essential for supporting the project. Examples include project management, safety measures, insurance, and regulatory compliance costs. (Fadel, 2025)

Furthermore, in the light of the above, considerations should be given to the productivity-related question on some aspects of productivity in construction which include-:

(i) What is output per worker hour?
(ii) What is productive worker time per total worker time?
(iii) How to measure value of work completed per worker hours?
(iv) How to aggregate value of work completed per worker costs?
(v) What is the earned value over the actual cost?
(vi) What is the earned hours over the actual hours? and
(vii) What is the worker hours per functional unit of the asset? (RICS, 2023)

Common Barriers to Construction Productivity

Construction industry suffers low productivity because of the following six main reasons:

1. Ignoring Construction Digital Tools: According to Fadel (2025), construction projects are typically complex, making it challenging to keep track of all the changes that occur on a daily basis. Using traditional tools like paper and pen sets you up for errors, delays, and miscommunications, which can impact project budgets and timelines.

A typical construction project can have a dozen to hundreds of workers. Without digital tools, managing such a large crew can be challenging.

2. Poor Communication on the Jobsite: Miscommunication and inaccurate data can lead to a whopping amount of money wasted on rework. For this reason, verbal communication can no longer be the only way to relay information on projects. It's important to have a more advanced system where documents are updated in real-time.

3. Coordination Issues: With hundreds or thousands of workers on site, each with different roles and goals, it might sometimes be difficult to ensure all of them work in perfect harmony. Such lack of coordination might lead to mistakes and, consequently, a waste of time and money.

4. Inefficient Use of Time: A survey by Fieldwire (2025) confirmed that workers spend only 30% of their time on actual buildings while the remaining 70% goes to preparing for tasks, gathering equipment and materials, and sometimes waiting for instructions on what to do next. This is already an inefficient use of time, meaning contractors must put in place measures to increase the percentage of time going to the actual building in comparison with the preparatory tasks.

5. Lack of Context When Managing Tasks: A common mistake in construction sites is giving workers tasks without enough context. When a task is given without providing all the necessary information, may lead loss of time in trying to understand what is required of workers.

6. Human Factors: In addition, several human factors affect construction productivity which could may include-:

(i) **Safety:** If the site doesn't feel safe, workers might spend more time on any particular task as they struggle to protect themselves from harm.

(ii) **Inappropriate behavior:** Deception, corruption, theft of materials and tools, and conflict of interest among team members can lead to a lack of morale, which consequently affects construction productivity.

(iii) **Environmental conditions:** How good or bad the area around the jobsite is can also affect productivity. The presence of hazardous materials, excessive noise, too much dust, inadequate lighting, poor ventilation, and general site disorganization can slow down workers.

(iv) **Other human factors:** There are several other human factors that can directly affect construction productivity. Inadequate breaks may leave workers tired, slowing down their pace of work. Long distances to sanitary facilities waste time and may make workers uncomfortable if they stay for long without releasing themselves. Late arrivals, early departures, extended breaks, and strikes leave little time for actual work. Lack of recognition and discriminatory work practices leave workers demoralized.

Work Sampling

Work sampling is a work measurement technique used in the determination of the amount of time a worker uses on a task and work sampling is a technique of finding the percentage rate of a particular activity by statistical sampling and random observations. The technique is used to determine ratio delayed that is the percentage of time a worker or machine is delayed or idle. It is also used to examine works that are not cyclic in nature. Work sampling involves making intermittent observations of the activities to be studied. Its original application found its root in the textile industry in the United Kingdom (Russell and Taylor, 2009)

Strategies to Enhance Construction Productivity

Update Construction Inventory: Poor inventory management is a major cause of low construction productivity. Most construction projects have a large inventory, which must be updated regularly. Examples of inventory in construction projects include building materials like cement, bricks, and steel bars; tools like hammers, drills, and saws; equipment like concrete mixers and cranes; safety gear like helmets, safety boots, and visibility jackets; and electrical supplies like wires, sockets, and switches. Workers should not run out of materials. Inventory management systems like BuilderMT or CoConstruct can help track materials from order to delivery and can alert stock/store keeper when supplies are running low. (Brandenburg etal., 2025)

Employ Technology for Better Workflows: Construction efficiency can be boosted directly by adopting relevant technology especially by integrating project management software. Not that there aren't advanced tools to help with this aspect of management, but many contractors still stick to traditional methods that weren't specifically designed for the construction industry.

These include mobile apps, fingerprint scanners, ID cards, and iris scanners. Construction workers are known to give plenty of excuses not to use these time-tracking systems. Taken these claims into account and designed an easy-to-use hardware time clock solution for check-ins and checkouts. This time-tracking solution uses AI-powered facial verification to automatically verify the times workers get to the site and leave. Workers simply key in their phone number, have their picture taken, and they can start their shift.

Make the Workplace Flexible: In their view, Randolph and Horman (2006), opined that workplace flexibility can boost productivity. Since construction work is labour intensive. It is good to ensure that workers are adequately rested. When they are in top physical and mental health, they operate machinery with the desired precision and complete tasks faster. An excellent approach is creating flexible work shifts, ensuring that workers have the much-desired work-life balance

Train Employees: It is essential to invest in the workforce's skills, technology in the construction industry is rapidly evolving. New tools and software are introduced every other day. A good example is the use of drones for surveying sites and the integration of Building Information Modelling (BIM) software. Workers can be trained on these technologies in order to improve their efficiency and accuracy in construction projects.

Integrate Data and Analytics Systems: Every new construction project is an opportunity to gather insightful data and analyze it. This enables better decision-making and efficiency. Analyze trends from current and past projects to be able to predict potential delays, optimize resource allocation, and enhance scheduling accuracy (Judson and Paul, 2022)

RESEARCH METHODOLOGY

A quantitative research methodology was adopted for this study which includes the usage of purposive sampling of construction sites in three randomly selected districts of Abuja metropolis. A structured questionnaire was administered to 75 randomly selected construction masons working on residential buildings. The usage of instrument such as stop clock to measure the time it takes an operative to lay square meters of blockwork and the usage of thermometer to measure the temperature of the sites both in the morning and evening sessions. the questionnaire centred on the profile of the respondents such as age, years of experience and level of education. The masons selected are those working on the substructural works of residential buildings in the sampled districts that are targeted for this study. Other demographic factors considered are (i) location of the work which includes the depth of the foundation (ii) average distance of stockpile of blocks and output of mason in relation to the time spent in achieving a task.

Table 1.0 AVERAGE OUTPUT FOR BLOCKWORK EXCEEDING 225MM IN SUBSTRUCTURE

DEPTH	AV.BLK LAID	AVG TIME	AV.OUTP PRODTVT	AV.MORN TEMP	AV BLK LAID	AVG TIME	AV. OUTP PRODTVT	AV. AFTN TEMP	TOTAL AV.TIME	AVG DIST	AVG WAGE/DA	AVG TOTAL OUTPUT	AVG. PROD PER HOUR
metre	no	hr	m2/hr	(°C)	no	hrs	m2/hr	(°C)	SPENT	metres	#	M2	
1	39.88	1.72	2.36	29.5	42.25	1.69	2.55	35.25	3.613	4.55	5375.00	**8.22**	4.91
1.5	37.14	2.3	1.74	27.85	39.43	2.43	1.66	35.14	4.82	5.71	5585.70	**7.7**	3.4
2	41	2.51	1.69	30	38	2.22	1.76	36.5	4.73	4.88	6550.00	**7.9**	3.45
2.5	35.4	2.59	1.42	28.5	37.13	2.95	1.32	34.56	5.53	4.5	6237.50	**7.25**	2.74
3	29.67	3.37	0.88	29	30.78	3.33	1.15	35.33	6.71	4.71	5711.11	**6.05**	2.03
3.5	31.29	3.67	0.86	28.57	32.43	3.37	0.96	35.14	7.01	5.41	6171.42	**6.37**	1.82
4	32.4	3.65	0.89	29.2	30.53	3.52	0.86	35.5	7.17	4.73	6600.00	**6.29**	1.75

Source: Researcher's Fieldwork (2025)

Table 1.0 shows the summary of mean output of a gang (1 mason and 2 unskilled labourers) working at different depth in the substructure. The laying of 225mm sandcrete blockwork at 1-meter-deep in the foundation presents the average total output of **8.22m²** while operation in 1.5 meters deep shows the average outputs of **7.7m²**. The average total outputs by a gang laying 225mm blocks at 2 meters deep is **7.9m²**while operation within 2.5 meters deep resulted to average output of **7.25m².** The operation at depth of 3 meters below the earth surface present an average outputs of **6.05m2** while an average outputs of **6.37m2** was derived from the depth of 3.5 meters. The blockwork operation in 4 meters' deep pit gives an average output of **6.29m².** The critical look on

the result of the output shows that certain factors were responsible for their derivations. Factors such as mixing distance, morning and afternoon temperature, wage and years of experience contributes immensely. These average outputs as shown in the Table1.0 above collaborates with the findings of Adamu et al, (2024) where 150mm wide hollow sandcrete blockwork were laid in the foundation with average output 12.85m^2 although it is expected that 150mm hollow sandcrete blockwork be higher in output because of its size and easy of laying.

In addition, the results from the output of masons were further subjected to linear regression analysis to determine the relationship between the variables using null hypothesis which includes

(i) there is no significant relationship between the output of mason per day and the wages per day

(ii) there is no significant relationship between the output of mason and the depth of the foundation

(iii) there is no significant relationship between the output of mason and the material distance

(iv) there is no significant relationship between the output of mason and the morning temperature

(v) there is no significant relationship between the output of mason and the afternoon temperature

The results of the above null hypotheses were tabulated below

Table 2.0. SUMMARY OF REGRESSION RESULTS FOR BLOCKWORK IN SUBSTRUCTURE

Analysis NO	X	Y	Type of Model	Regression Equation	R2 (%)	F cal	Ftab	P values	Strength of Relationship	Remark	Action On Hypothesis
1	Wage/day blk in substr	output blk in subst	linear simple	Y=1.668+2.51x 10^{-5}X	0.2	0.059	4.18	0.81	Weak	NS	Accept Ho
2	Depth blk subst	output blk in subst	linear simple	y=2.968-0.655x	43.9	22.671	4.18	0.00	fairly strong	SS	Reject Ho
3	Mat'l dist subst	output blk in subst	linear simple	y=1.692+0.026x	0.4	0.116	4.18	0.74	Weak	NS	Accept Ho
4	Morg Temp blk sub	Morg outp blk sub	linear simple	y=0.847+0.033x	2.5	0.736	4.18	0.40	Weak	NS	Accept Ho
5	Aftn Temp blk sub	Aftn outp blk sub	linear simple	y=1.969-0.001x	0.00	0.003	4.18	0.96	Weak	NS	Accept Ho

Source: Author's statistical analysis (2025)

The influence of cost of artisan per day on the output of artisan per day reveals regression equation Y= 1.668+2.51X10^{-5}X. The Coefficient of determination (R^2) value is 0.2 %. The Observed F calculated value is 0.059 while the F tabulated value is 4.18. The Probability (P) value is 0.811 which is greater than the 0.05. This shows a weak

relationship between the variable tested and stipulates that the wages being paid to artisan per day do not influence the output of work done per day. Therefore, the null hypothesis is accepted.

In addition, the relationship between the location of work in substructure (depth) and its influence on the output of work done by masons reveals a regression equation Y=2.968-0.655X. The Coefficient of determination (R^2) of 43.9%. This shows a significant statistic between the variables tested. The Observed F calculated is 22.671 and F tabulated 4.18 and the Probability value is 0.000. The outcome of this results shows that there is a significant relationship between the location of work in substructure and the output of mason.

The summary of regression result for material distance to the point of usage and the output of artisan per day presents the regression equation of Y= 1.692+0.026X. The Observed F calculated value is 0.116 and the F tabulated value is 4.18. The Probability value of the relationships shows 0.735 as against the Level of Significance of 0.005. The Coefficient of Determination value is 0.4%. This shows a weak relationship and null hypothesis (Ho) is accepted. Regressing the morning temperature on the output of the artisan per day present an equation of Y= 0.847+0.033X. The Coefficient of Determination (R^2) shows a value of 2.5% while the Observed F calculated shows a value of 0.736 against the F tabulated value of 4.18. The Probability (P) value of 0.40 is greater than the Level of Significance value of 0.05. This implies that morning temperature does not have any effect on the output of the masons in the substructure, hence the Null hypothesis is accepted. In the same vein, the effect of afternoon temperature on the output of masons in the substructure reveals a regression equation of Y = 1.969-0.001X. The Coefficient of Determination (R^2) shows a value of 0.00%. The Observed F calculated present a value of 0.003 against the 4.18 value of F tabulated. The Level of significance of the variables tested is far less than the Probability value of 0.96. This present a weak relationship; therefore, null hypothesis is accepted. Therefore, the stated objective which evaluates the influence of relevant demographic/site factors (depth, wages, temperature and material distance) on the output of the masons is achieved. It should be noted that among demographic factors tested in this study, only the point of work (depth) shows significant relationship with the output of a gang of mason. This means that as depth of workplace increases, the output decreases. Therefore, considerations should be given to Nigerian masons working in the substructural section of a building as regards wages and hours of work.

CONCLUSION

The demographic/site factors that were identified in this paper are the most common factors prevailing and affecting the output of workers in the Nigerian construction sites. The impact of wages on productivity/output of workers as shown in the results of

analysis though may not exert major influence, but other factors such as prevailing economic climate and general labour policy do influence the daily pay of Nigerian masons. In addition, masons do place emphasis on the convenience of the working place and point of operation especially those who operate in the substructural section of a building. The result as shown from the analysis explain how the depth of the point of operation do greatly affects the output of masons. Material distance to the point of operation is also a major influencer of masons' output. It should be noted however, that the temperature of the site both in the morning and afternoon session did not exert any influence whatsoever on the output of the masons. This may be as a result of the period of the year that the research was carried out but in most cases, masons tend to deliver when the condition of the site is favourable. In addition, living wage per hour of work should be recommended and implemented by construction stakeholders and labour unions.

REFERENCES

Adamu, A., Onyeagam, O.P., Yahya, A., Kabiru,M.J, Oyekeye, O,I and Ashiru, A.S (2024). Assessment of operational level on output of blocklaying for the Nigerian Construction Projects. Nasara Journal of Science and Technology, Federal Polytechnic Nassarawa, Nigeria. Volume 11(1).

Brandenburg, S. G. Haas, C. T. and Byrom, K. (2006) "Strategic Management of Human Resources in Construction," Journal of Management in Engineering, vol. 22, no. 2, pp. 89– 96, Apr. 2006, doi: https://doi.org/10.1061/(asce)0742-597x(2006)22:2(89)

Bureau of Labour Statistic (2025). Labour Productivity and Cost Measures for selected construction industries. A Publication of US BLS Current Employment Statistics Database. USA.

Eliseo-Dantés, Hortensia, Castro-De la Cruz, Jucelly, Pérez-Pérez, Iris Cristel and García-Reyes, David Antonio. (2025). Factors and strategies for improving organizational productivity: A theoretical analysis. ECORFAN Journal Mexico. 16[34]1-7: e21634107. https://doi.org/10.35429/EJM.2025.16.34.2.1.7

Fadel, A. (2025). How to improve productivity on a construction sites. A Publication of SmartBarrel. https://smartbarrel.io/blog/productivity-on-a-construction-site/

Fieldwire (2026). Is construction stuck in 1960? A Publication of Fieldwire magazine. www. Fieldwire.com

Judson, L. and Paul, V. K. (2022) "Known Uncertainty Factors Affecting Building Construction Project Cost," Journal of Real Estate Construction & Management, vol. 37, no. S1, pp. 243–253, Sep. 2022, doi: https://doi.org/10.1177/29776 5702022s127.

Randolph, T and Horman, M. J. (2006). "Fundamental Principles of Workforce 40 © MAT Journals 2025. All Rights Reserved Evaluating Key Challenges and Optimization Strategies Sumit Sharma Management," Journal of Construction Engineering and Management, vol. 132, no. 1, pp. 97 104, Jan. 2006, doi: https://doi.org/10.1061/(asce)0733-

RICS (2023). Construction Productivity Report: Global Construction Monitor Survey. A Publication of Royal Institute of Chartered Surveyors. UK. http//www.rics.org>news> insight

Russell, R. S. and Taylor, B. W. (2009). "Operations Management along the Supply Chain," Scientific Research Publishing 6th Edition, John wiley and Sons Ltd., Chichester,

Sharma, S (2025). Evaluating Key Challenges and Optimization Strategies for Enhancing Labour Productivity on Construction Sites. Journal of Civil and Construction Engineering. Vol. 11, Issue 2 (May – August, 2025) pp: (24-41) e-ISSN: 2457-001X Department of Building Engineering and Management, School of Planning and Architecture, New Delhi, India

Tell, J and Frisa, K (2026). The ultimate guide to construction productivity. A monthly publication of Procore magazine. https://www.procore.com>library>improve