Age-performance consideration in the recruitment of tradespeople in Nigerian construction industry

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Abstract

Purpose – Age is one of the critical factors used by many organizations to determine employees' performance. It is being considered in the retirement process of construction professionals. However, age as a critical factor is not considered in the recruitment of a specific set of workers in the construction industry. Therefore, this study investigated the significant relationship between the ages of tradespeople and their performance in construction projects. The study also explored the age at which performance begins to decline and proposes strategies that can be used to sustain their effectiveness before the official retirement age.

Design/methodology/approach – Mixed methods research designs were adopted in the study. To be precise, physical observations, interviews and questionnaires were the instruments used for data collection in the mixed methods research design.

Findings – The outcomes of the study revealed that the age groups of tradespeople in the Nigerian construction industry are 16–30 (group one), 31–45 (group two) and 46–58 (group three) respectively. Group three is the prevalent age group. It was also discovered that performance begins to decline at 53 years. The age-performance decline of tradespeople in Nigerian construction projects can be delayed through certain strategies such as regular strength training exercises and an adequate nutritional lifestyle.

Research limitations/implications – The study enables construction managers to have an adequate understanding of the negative influence of old age on the performance of tradespeople in construction projects. This will enable construction firm managers to recruit from the age range of 16–52 and stop retiring employees within this age bracket, consequently curbing the skills gap which is prevalent in the study context and the global construction industry. The study is limited to tradespeople performance in construction firms in Abuja, Nigeria where there are several ongoing projects on a daily basis.

Practical implications – The study enables project managers to estimate the number of tradespeople required for a particular task and consequently save the aged tradespeople from health risks associated with excessive workloads.

Originality/value – This paper is the first of its kind to be conducted in the study context, to establish the specific age at which performance begins to decline among construction tradespeople.

Keywords Age, Performance, Recruitment, Retrenchment, Tradespeople

Paper type Research paper

1. Introduction

The construction industry plays an important role in the social, economic and political development of a country (Onungwa *et al.*, 2017). Unfortunately, in Nigeria, this giant stride industry is now gradually being eroded as the economic crisis in the country has lasted more than a decade. Within these decades, the country's leadership had changed severally. Each regime has different methods of mitigating economic difficulties. However, the methods employed by each regime over the years have made more employees lose their jobs. It is imperative to note that employees in the construction industry are regarded as essential resources as they combine all resources namely; materials plant, equipment and finance to produce the various construction products (Robbins and Judge, 2013). This implies that out of all the factors of production, the workforce has the highest priority and is the most significant

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factor of production that plays a pivotal role in areas of productivity and quality. This leaves employees as the significant resource open to performance improvement in any organization (Robbins and Judge, 2013; Madan and Bajwa, 2016).

Raphael and Peter (2021) pointed out that employees' performance is one of the critical factors that contribute significantly to organizational success. Employees create a competitive advantage for the organization through their performance; thus, organizations are mostly busy finding ways to attain the highest possible levels of employee performance (Chatman *et al.*, 2019). The literature identified several factors that can affect employees' performance. In fact, recent studies by Janetius *et al.* (2019) and Michael (2019) established age as one of the critical or significant factors that can affect employees' performance. Josef (2010) conducted a study in the German manufacturing industry and established a negative relationship between aged workers and performance. The study by Tunji-Olayeni *et al.* (2017) revealed that employees' performance will gradually decrease with age and to some extent, the nature of work involved over the years.

Conversely, Madan and Bajwa (2016) contended that aged workers are of more benefit to organizations as they are well experienced and may not need to be trained and retrained, which could be one of the cost-saving measures for such organizations. Knippenberg *et al.* (2020) added that aged workers add qualities acquired during their long career lives which may be difficult to replace. Therefore, aged workers with long-time experience are related to better organizational performance. Kunze *et al.* (2013), Bal *et al.* (2015) and Erica and Muhammad (2016) observed that the average workforce age is negatively associated with quantitative organizational performance but positively related to qualitative output. Based on the literature, it can be emphasized that age is one of the critical factors used by many employers to determine employees' performance for the achievement of organizations' goals. There are studies on the relationship between age and employees' performance in the construction industry. However, most of the studies focused on construction professionals (Kunze *et al.*, 2013; Josef, 2010; Bal *et al.*, 2015; Tunji-Olayeni *et al.*, 2017). Research on age as a critical factor in the recruitment of tradespeople in the construction industry is scarce in the literature.

In addition, there seems to be scarce literature on the specific age at which performance begins to decline among construction tradespeople (artesians, craftsmen and operatives such as plumbers and electricians). Irrespective of age, construction tradespeople are engaged in one activity or the other based on their availability. Construction tradespeople are considered in this study as they are engaged in strenuous activities on a daily basis (Kukoyi and Smallwood, 2017). Construction tradespeople were also selected for this study because they are the set of workers that carry out the actual building production work (Tanko *et al.*, 2020). Premised on the established gaps in the literature, the research aims to investigate the age that is most appropriate in terms of performance for the recruitment of tradespeople in the Nigerian construction industry.

Based on the above-stated aim, the study intends to answer the following questions:

(1) What are the age groups of tradespeople in the Nigerian construction industry?

(2) What is the relationship between their age groups and performance?

(3) At what age will performance begin to decline in their daily activities?

With the argument put forward by Madan and Bajwa (2016) and Knippenberg *et al.* (2020) on the benefits of aged workers in organizations, coupled with the findings in the literature that trained young tradespeople are becoming scarce in the construction sector (Ajala *et al.*, 2020); "*which strategies can be put in place to ensure that the performance of the aged construction tradespeople is effective before the actual retirement age?* (4th research question)". The research-specific objectives are to:

(1) Find out the age groups of tradespeople in the Nigerian construction industry;

(2) Establish the relationship between the tradespeople's age groups and performance;

(3) Investigate the age at which performance begins to decline in the trades people's daily activities and

(4) Propose strategies that can be adopted to ensure that the performance of the aged construction tradespeople is effective before the actual retirement age.

With the need for better outputs/profits maximization in the global construction industry so as to be able to compete with the international market, there is a need to pay adequate attention to silent factors that could enhance or inhibit employee performance. Thus, this study will serve as a guide for project managers to put age and performance into consideration in the recruitment of tradespeople for effective project performance not only in the study context but in the global construction industry.

The other sections of this paper are structured as follows: section 2 comprises extant literature pertaining to understanding the concept of the relationship between workers' age and performance in projects. Section 3 provides a justification of the research methods adopted for data collection and analysis. The results from the data collection and analysis exercise are presented in Section 4. Section 5 emphasizes the paper's implications/limitations, conclusion and recommendations.

2. Literature review

2.1 Overview of Nigerian construction industry

Globally, the construction industry is regarded as one of the major industries among the top that contribute about 5–6% to the world gross domestic product (GDP) (Bello *et al.*, 2022; Olanrewaju *et al.*, 2020). To be precise, Dakhil (2013) revealed that the industry contributes 6% to the global GDP. In the first quarter of the year 2021, the industry contribution to the global GDP has increased to 10.17% (Dakhil, 2013). In developing nations such as Nigeria, the construction industry provides new infrastructures for the development of the country (Dakhil, 2013; Olanrewaju *et al.*, 2020). The literature shows that the Nigerian construction industry is the largest in West African countries (Olanrewaju *et al.*, 2020). Despite the large size of the industry, it is imperative to note that the industry is known to be very slow in the adoption of new technologies (Olanrewaju *et al.*, 2020). The industry utilizes a wide range of workers from skilled to unskilled to achieve its goals (Kunze *et al.*, 2013). This implies that the Nigerian construction industry is dominated by human labor (Bal *et al.*, 2015). Therefore, studies on different measures that can be used to judge workers' performance in construction projects, as well as the factors that inhibit their performance in daily tasks are always topics of discussion by researchers across the globe (Dolton *et al.*, 2016; Tunji-Olayeni *et al.*, 2017). These are explained in the following subsections:

2.1.1 Factors that can be used to measure employees' performance in organizations. Globally, researchers have investigated various methods for measuring employee/organizational performance. These include cost, time, quality, quantity, knowledge, or creativity of an individual towards the accomplished work that is in harmony with the responsibility during a specific period (Madan and Bajwa, 2016). This implies that customer satisfaction in the construction industry is measured by the ability of the construction team to deliver the project within the stipulated time, cost and quality (Madan and Bajwa, 2016). Similarly, Kuroshi and Lawal (2014), Devicienti *et al.* (2015) stated that workers' performance can be measured by individuals using combinations of analytical techniques and personal judgment. Okolie and Kawedo (2018) further identified seven different methods that can be used to measure employees' performance. These include the level of punctuality to work

(whether the employee is a perpetual latecomer or not), the quality of work of the employee (if the employee completes jobs on time at the expected quality/standard) and personal habits displayed at work (whether a particular employee uses work time to engage in gossips and unauthorized breaks), employees work attitude (whether the employee is the type that exhibits insubordination and goes against the organization's policies), client survey (an investigation to identify how an employee's contribution leads to customers or clients satisfaction), random checks (occasional checking of vital records of an employee work) and personal presentation (the way an employee presents himself or herself both in dressing and manners if it positively or negatively affects the image of the organization). Several other authors including Pencavel (2015), De Grip *et al.* (2016) and Dolton *et al.* (2016) indicate hearing/sighting abilities, strength, anxiety, response time, employees commitment and how patient and employee is while work is in progress as other methods for measure employees' performance.

In this study, the above-stated methods of measuring employees' performance were adopted. These measures are summarized in Table 1.

2.1.2 Factors affecting employee's performance. A study by Madan and Bajwa (2016) reveals that employees' performance is not determined by a single factor, but by several factors such as age, stress, training, motivation, leadership, emotional intelligence and working environment. Raphael and Peter (2021) found that factors such as job satisfaction, training, flexible work arrangements, career development and the likes have direct influences on employees' performance at the workplace. Asiyanbola (2018) affirmed that factors such as absenteeism and turnover have a significant effect on employee performance. Grant and Ashford (2008) argued that the level of employees' proactivity is connected to their performance. This implies that proactive employees tend to perform more efficiently than those that are less proactive (Grant and Ashford, 2008). Grant and Ashford (2008) further established adaptability as another factor that affects employee performance. These authors opined that if new employees adapt to the work environment, their performance tends to be improved. This confers that the poor adaptability of an employee to a new work environment will negatively affect the performance of the employee. Based on the reviewed literature, there are studies on several factors that can affect employees' performance. However, recent

Table 1.
Factors for measuring employee performance

Employees performance measures	Sources
Employees hearing ability during daily activities	Okolie and Kawedo (2018)
Employees sighting ability while work is in progress	Okolie and Kawedo (2018), Kuroshi and Lawal (2014)
Level at which employees get tired in the progress of work (Employees strength)	Dolton *et al.* (2016), Devicienti *et al.* (2015)
The level of employees anxiety in the progress of work	Pencavel (2015), De Grip *et al.* (2016)
The level of punctuality to work	Okolie and Kawedo (2018)
Frequencies of annual sick leaves	Dolton *et al.* (2016)
The quality/standard of employees work	Okolie and Kawedo (2018)
Employees response time	Okolie and Kawedo (2018), Pencavel (2015)
Frequencies of employees insubordination to organization policies	Okolie and Kawedo (2018), De Grip *et al.* (2016), Dolton *et al.* (2016)
Employees patience and endurance ability	Okolie and Kawedo (2018), De Grip *et al.* (2016), Dolton *et al.* (2016)
Frequencies of employees request for information (RFI) on a daily basis	Pencavel (2015), De Grip *et al.* (2016)
Frequencies of error in employees work on a daily basis	Devicienti *et al.* (2015), Pencavel (2015)
Frequencies of rework in employees tasks on a daily basis	Kuroshi and Lawal (2014), De Grip *et al.* (2016)

studies by Janetius *et al.* (2019) and Michael (2019) established age as one of the critical or significant factors. Despite its significance, its effect on workers in the construction sector, specifically the tradespeople, have not been investigated. In addition, Madan and Bajwa (2016) emphasized that high-performance organizations are more likely to survive and compete favorably in this ever-changing and competitive business environment. To this end, organizations need workers that are psychologically balanced to increase performance and productivity. A factor such as employees' age that significantly determines the extent of employees' psychological condition may influence employees' performance (Berger, 2006). However, this has not been experimentally established among the tradespeople in the Nigerian construction industry.

2.1.2.1 Age and employees' performance relationships in organizations. The relationship between employees' age and performance has been studied by several researchers and amassed evidence overwhelmingly suggests that age is a poor predictor of job performance (Josef, 2010). This implies that some authors believe that there is no significant relationship between age and performance (Finkelstein *et al.*, 1995; Perry *et al.*, 1996). However, age has been linked positively to job performance by several other authors. For instance, Kunze *et al.* (2013), Bal *et al.* (2015), Tunji-Olayeni *et al.* (2017) pointed out that the performance of an individual will gradually decrease with age, although to a certain extent, which may also depend on the work type. Based on the previous studies (Josef, 2010; Knippenberg *et al.*, 2020; Madan and Bajwa, 2016; Erica and Muhammad, 2016), there is a controversy whether age has a significant impact on employees' performance. Therefore, this study was conducted to examine the relationship between tradespeople's age groups and their performance in construction projects.

2.2 Tradespeople in the Nigerian construction industry

Artisans, craftsmen and operatives that are physically and directly involved in the execution of field works and production of the finished buildings and other construction-related structures are known as construction tradespeople (Eze *et al.*, 2017). According to Eze and Sofolahan (2020), they are different from the built environment professionals and experts and require certain training that qualify them as tradespeople.

2.3 Strategies that can be used to delay employees' performance decline in projects

Based on the findings of Tunji-Olayeni *et al.* (2017) that the performance of individual's declines with age, some studies has imperatively established strategies for delaying performance decline. Lazarus *et al.* (2019) discovered that physical activities such as regular strength training exercises and an adequate nutritional lifestyle are some of the underlying strategies that can be used. Lazarus *et al.* (2019) further stated that physical activity (regular strength exercise) has strong benefits for maintaining functional independence and health-related quality of life, in addition to possible lifespan extension. In the same vein, Galland (2010) reiterated that nutritional lifestyle has been established as an approach for hindering the age-related decline in functional performance and increasing lifespan.

3. Research methodology

To achieve the aim of this study, mixed methods research design was adopted. The qualitative design was used to allow a deeper understanding of holistic interactions among the participants in the case study firms (Gray, 2014). The qualitative method of data collection was also adopted in the study as it enabled the researchers to make use of physical observation and interviews for an adequate understanding of the subject under investigation

(Stringer, 2014). The quantitative design was adopted as it assisted the researchers to make use of questionnaires to obtain information from a wider population and generalize the data obtained in the study to other contexts (Creswell, 2009; Gray, 2014). To be precise, physical observation, interviews and questionnaires were the instruments used for data collection in the research designs. Details of these instruments and how they were used to obtain the necessary information in the study population are explained in the following headings:

3.1 Study population/sample size

The population for the study comprises 188 registered construction firms located in Abuja, Nigeria. These firms are the ones where their functioning email addresses were available on the Internet when the study was conducted. It is imperative to note that Abuja is the capital city of Nigeria where several new buildings and infrastructural projects take place regularly. In line with Stephanie (2021), a purposive technique that allows for sampling of groups of knowledgeable individuals that are well experienced in the area of their specialization, available, willing to participate and capable of communicating to share their experiences was adopted to obtain the population's accurate representation. Critical case sampling and expert case sampling which are types of purposive sampling techniques were combined to achieve this (Stephanie, 2021). Accordingly, critical case sampling entails approaching only respondents that have first-hand information about the phenomenon a researcher is studying, while expert sampling deals with respondents that have expertise in the area of the study (Stephanie, 2021). This seems appropriate for this study. Therefore, the purposive technique was used to obtain the population's accurate representation (Wium and Louw, 2018). This implies that out of the 188 registered construction firms, emphasis was placed on the firms with ongoing site projects, well experienced and their tradespeople were willing to participate in the study. These conditions were used to reduce the total number of firms to 22, which was used for the study.

3.2 The physical observation strand

It is essential to note that the physical observation (PO) exercise was first conducted to establish the fundamental theories and practice standards of the age groups of tradespeople in different jobs in Nigerian construction projects (Aka *et al.*, 2019). Therefore, the researchers covered the 22 sites owned by the purposefully selected firms where work was going on. The typical forms of construction tradespeople that their ages were observed in the various sites covered are the concretors/bricklayers/masons, carpenters, iron benders, electricians, plumbers and tilers. These sets of workers were considered for the study as they move from one location to another with heavy objects or loads (strenuous activities) (Eze and Sofolahan, 2020). Besides, Eze *et al.* (2017) pointed out that these sets of workers are the personnel that are physically and directly involved in the execution of works and production of the finished buildings and other construction-related structures. Stringer (2014) specified a minimum of 2 h for PO exercise. Therefore, the researchers spent 3–4 h on each site during the study (Monday to Saturday). In all, the researchers spent approximately three months in the PO exercise in the study.

3.3 Survey administration

The information obtained in the reviewed literature and PO phase of the study served as a guide in the designing of the questionnaire (Pinto and Patanakul, 2015). The questionnaire used in the study was in four sections. The first section placed emphasis on the background information of the respondents of the study. The second section was used to ascertain the information on the various age groups of tradespeople in the construction industry.

The respondents were asked to rank the information obtained in the PO phase in accordance with Morenikeji (2006) (less prevalent, prevalent and very prevalent). The third section investigated the relationship between tradespeople's age groups and their performance in all the tasks carried out on a daily basis. To ensure that the data obtained in this section is unbiased (Pinto and Patanakul, 2015), project managers, assistant project managers, contractors and subcontractors in each case study firm were also given the same questionnaires to fill out. It is essential to note that project managers, assistant project managers, contractors and subcontractors were used as guides in the study as they were always available on the site to organize, coordinate and oversee the success of the jobs being executed by tradespeople. All the participants of the study (construction tradespeople and professionals) were encouraged to rely on their experiences in the rating of their agreements on the relationship of tradespeople age groups and their performance based on 13 employees' performance measures discovered in the literature. The respondents were required to rank their opinions on a five-point Liker scale (Gravetter and Wallnau, 2008). In the five-point Liker scale, 1 = very low, 2 = low, 3 = moderate, 4 = high and 5 = very high (see Gravetter and Wallnau, 2008 for similar scales). In terms of remarks, the cut-off points modified from Morenikeji (2006) were used in which 0.5–1.4 implies very low, 1.5–2.4 infers low, 2.5–3.4 advocates moderate, 3.5–4.4 indicates high and 4.5–5.0 designates very high.

The last section of the questionnaire was used to establish the age at which performance begins to decline in the various jobs carried out by construction tradespeople. Multiple methods have been developed to estimate the age of peak performance, including typical polynomial curve fitting, mixed models, rolling means, quadratic, second-order polynomial fittings and other regression analyses (Lara *et al.*, 2014; Allen and Hopkins, 2015). Most of these methods resulted in a poor estimate of the age of peak performance. One of the empirical approaches that provided an excellent fit for age-performance data was introduced by Moore in 1975 (Berthelot *et al.*, 2019). However, Moore's approach was also criticized for having no biological or physiological meaning. In a study conducted by Rudolph *et al.* (2015), it was discovered that ageism occurs in a variety of work contexts and various lines of evidence for the presence and occurrence of ageism at work can simply be drawn from laboratory or field research. Therefore, age performance decline was established in this study by asking the respondents to affirm their options through a five-point Likert scale on certain age groups (40–45, 46–50, 51–55, 56–60, 61–65 and 66–70). These are the age groups that are perceived or generally believed as elders in society (Sousa *et al.*, 2019). In the five-point Liker scale, 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree. The questionnaires that were given to the tradespeople were collected back immediately through the collective effort of the assistant project manager of each site visited.

Most of the tradespeople in all the sites were not well-read; therefore, the researchers and the assistant project manager at each site read, interpreted and guided the workers in filling the questionnaires. Based on this approach, all the questionnaires given to the tradespeople were duly filled and returned to all the sites visited. In all, the 127 questionnaires that were randomly administered to the construction tradespeople were collected back in the study, which represents a 100% response rate. However, 121 questionnaires were administered to the managers, assistant managers, contractors and subcontractors that were randomly selected in all the case study sites. Based on their academic background and experience, the researchers allowed the professionals to go with the questionnaires, filled in their various offices and returned back on a later day. Consequently, out of the 121 questionnaires distributed to the professionals, only 87 were correctly filled and returned which represents 71.90% response rates from the professionals.

3.3.1 Analyses of quantitative data. The returned questionnaires (tradespeople and professionals) were analyzed together with the use of different statistical tools such as Cronbach's alpha (for reliability test), Kruskal–Wallis test (KWT), Mann–Whitney U (MWU), Mean item score (MIS) and Pearson correlation analysis (PCA). KWT and MWU tests were

used to determine if there are statistically significant differences in the opinions of different age groups of the study participants with different educational backgrounds regarding the assessed variables. The MIS was used to understand the nature of relationships between employees' age and performance over the years. Hence, it was used to determine the influence or relationship between tradespeople's age groups and performance in construction projects. The PCA was used to establish the specific age at which performance begins to reduce among construction tradespeople in the study context.

3.4 The interview study

Face-to-face interviews with semi-structured questions were conducted to determine the strategies that can be used to reduce the negative effect of old age on employees' performance. Managers and their assistants in all the 22 selected firms (44 participants) were the only ones that participated in the interview study. They were selected based on their experience and academic qualifications. Their academic qualifications range from first degree to MSc. All the interviews conducted range between 30 and 45 min. The interviews were conducted over a two-month period in the offices of each professional. The interviews were tape-recorded and transcribed accordingly. Thus, thematic content analysis was used to analyze the interview data (Stringer, 2014). It is essential to note that for any form of an interview to be successful, it must have a major theme of the interviewers (Stringer, 2014). Therefore, the researchers closely examined the data to identify common themes that came up repeatedly in the interviews. Based on the content of the interviews, the researchers used phrases to arrange the content into categories and sub-categories (Krippendorff, 2012). The themes (categories and sub-categories) that were obtained from the analyzed data were validated through a follow-up interview among the managers of the 22 case study firms.

4. Results and discussion

The information obtained in the qualitative and quantitative studies conducted are explained as follow:

4.1 Demographic information of the study respondents

Details of the demographic information of the tradespeople in the study are presented in Table 2. That of the managers/assistant managers is summarized in Table 3.

Table 2. Demographic information of the study respondents (Tradespeople)

Variables	Characteristics	Frequency
Educational qualification	Primary school leavers	32
	Secondary school leavers	45
	ND holders	20
	Technical college	30
Work experience	Less than 10 years	10
	10–15 yrs	20
	15–20 yrs	37
	20–25 yrs	30
	25–30 yrs	30
Work designation	Carpenters	19
	Mesons/Bricklayers/foremen	47
	Plumbers	10
	Iron benders	18
	Electricians	12
	Tilers	21

Variables	Characteristics	Frequency
Educational qualification	PhD	5
	MSC	29
	BSC/HND	48
	ND/NCE	39
Work experience	10–15 yrs	51
	15–20 yrs	43
	20–25 yrs	17
	25–30 yrs	10
Work designation	Architects	27
	Builders	35
	Structural engineers	22
	Quantity surveyors	18
	Civil engineers	19

Table 3. Demographic information of the study respondents (construction professionals)

The demographic information of the participants revealed that the professionals have the requisite knowledge to properly fill the questionnaire. The construction tradespeople did not and were assisted in the survey exercise.

4.2 The various age groups of tradespeople in construction industry

The literature indicates that four age groups of workers exist in business organizations. The age groups range from early to mature (Hellriegel, 2010). However, in the course of PO conducted in this study, three sets of construction tradespeople were observed in the 22 sites visited. The first set of tradespeople (foremen/masons/bricklayers, carpenters, plumbers, iron benders and tilers) looked very young and was termed group 1. Researchers' perception and brief interaction with some of the participants of the study revealed that the ages of the tradespeople in this group range from 16 to 30. The second set of tradespeople was a bit older compared with group 1. They were also found in all the sites visited and were named group 2. Their ages range from 31 to 45. This age group seems to be more in number than group 1. The third set of tradespeople (group 3) were those that could be considered as aged workers due to their physical appearances and were more in number in all the sites visited than groups 1 and 2. Their ages range from 46–58.

With the exception of group 3, it can be emphasized that the age groups of tradespeople in the study context construction industry are still within their active years (less than the official retirement age of 60 years). Though, group three is more in number than groups one and two in all the sites. This finding is consistent with what has been observed in the literature. For instance, a recent study by Ajala *et al.* (2020) revealed that there is a shortage of young skilled laborers in the Nigerian construction industry. Similarly, Dabok *et al.* (2019) emphasized that youths' preoccupation with quick money-making businesses hinders them to acquire the required skills that can make them work in the construction industry. Having failed in the businesses they rushed into, they join the industry in their old age, which may be the only option left to survive. The industry engaged them due to a shortage of manpower. This makes aged and semi-skilled labors to be prevalent in the construction industry (Kaoma and Muya, 2016). Further, Spotlight on Statistics (2020) revealed that two-thirds of those employed in the Asian construction industry are between the ages of 24–54. However, between 2003 and 2020, the percentage of construction workers (ages 55 years and above) nearly increased from 11.5 to 22.7%. Youths between the ages of 16–24 were underrepresented (9.4%). This increase in aged workers reflects the aging problem of construction workers in the Asian construction industry. In a study conducted by Shepherd (2017) on the global age distribution of workers

within the house-building sector, it was also discovered that the highest proportion of workers in house building is between 45 and 54 years (27.2%). The second-largest age group (22%) comprises those aged 35–44 years. The proportion of workers aged 25–34 years was the least (19%) in the population. Based on the literature and the PO conducted, it can be contended that the aging problem in the construction industry is not only applicable to Nigeria but to other developed countries across the globe.

4.3 Respondents' perspective on the prevalent age groups of tradespeople in construction industry

The opinions of the respondents corresponded with what has been observed in the literature and PO exercise on the prevalence of aged tradespeople in the construction sector. Therefore, it can be strongly affirmed that aged tradespeople dominate Nigerian construction industries. The opinions of the respondents also support the existing literature on the aging problem in the global construction industry (see Table 4).

4.4 Tradespeople age groups and performance measures relationship in projects

As stated in the methods section of this paper, to establish the relationship between tradespeople age groups and their performance in construction projects, emphasis was based on 13 performance measures identified in the literature. The opinions of the respondents regarding these variables are presented in Table 5. The high Cornbrash's (α) value obtained for all the respondents (0.975 = excellent) in the questionnaire study shows the reliability and acceptability of the data (Sakaram and Bougie, 2010). The standard deviations (SD) obtained are also within the acceptable range, as they indicate that there were low variations in the responses of the participants of the study (Sakaram and Bougie, 2010).

Therefore, it can be contended that the data collected in the questionnaire is reliable, unbiased and of high quality (Gravetter and Wallnau, 2008). To find out if there is a significant statistical difference in the opinions of the respondents (construction professionals and tradespeople) in the rating of the 13 variables due to differences in their age groups and academic background, the Kruskal–Wallis test was first conducted (Digital Bridge Institute (DBI), 2018) (see Table 6). The outcomes of the Kruskal–Wallis test indicate that the tradespeople and professionals have different perceptions of three of the variables namely employees hearing/sighting abilities and employees' strength during daily activities. It is imperative to note that these three variables have *p*-values that are less than 0.05 at 2-tailed significant levels. Therefore, the Mann–Whitney *U* test (Table 7) was further conducted.

The *p*-values of the remaining nine variables in the Kruskal–Wallis test are greater than 0.05 at 2-tailed significant levels. Whereas, the *p*-values of all the 13 variables in the Mann–Whitney *U* test are greater than 0.05 at 2 tailed significant levels. This infers that despite the variation in the respondents' academic background and age, there is no significant statistical difference in their perceptions regarding the rating on age and performance relationship in construction projects.

In Table 5, it can be observed that groups 1 and 2 received passed or fair remarks (92.3%) in all the variables with the exception of frequencies of employees' insubordination to organization policies. Group 3 received fair remarks in 8 of the 13 variables (61.5%).

Table 4.
Prevalent age group of tradespeople ($\alpha = 0.871$ (excellent))

Prevalent age groups of tradespeople	MIS	Ranking	Remark	Chi-square	Sig	Decision
16–30 (group 1)	3.516	2nd	Less prevalent	1.179	0.221	Accept
31–45 (group 2)	3.141	3rd	Prevalent	2.251	0.091	Accept
46–58 (group 3)	4.672	1st	Very prevalent	0.722	0.671	Accept

Performance measures	Group 1 SD	MIS	Remark	Group 2 SD	MIS	Remark	Group 3 SD	MIS	Remark
Employees hearing ability during daily activities	0.91	4.12	High	0.83	3.91	High	0.99	2.72	Moderate
Employees sighting ability while work is in progress	0.81	4.51	Very high	0.91	4.57	Very high	0.87	2.85	Moderate
Level at which employees get tired in the progress of work (Employees strength)	0.93	1.31	Very low	0.73	1.42	Very low	0.74	3.56	High
The level of employees anxiety in the progress of work	0.86	2.31	Low	0.81	1.33	Very low	0.95	2.27	Moderate
The level of punctuality to work	0.84	2.85	Moderate	0.74	2.65	Moderate	0.91	3.68	High
Frequencies of annual sick leaves	0.96	1.21	Very low	0.82	1.31	Very low	0.76	3.75	High
The quality/standard of employees work	087	3.41	Moderate	0.79	3.12	Moderate	0.91	3.31	Moderate
Employees response time	0.87	4.71	Very high	0.83	4.81	Very high	0.77	2.64	Moderate
Frequencies of employees insubordination to organization policies	0.96	2.14	Low	0.79	1.44	Very low	0.85	1.14	Very low
Employees patience and endurance ability	0.89	3.21	Moderate	0.81	3.57	High	0.98	3.55	High
Frequencies of employees request for information (RFI) on a daily basis	0.97	1.52	Very low	0.87	2.52	Low	0.82	3.57	Moderate
Frequencies of error in employees work on a daily basis	0.98	1.73	Low	0.88	2.35	Low	0.81	3.55	High
Frequencies of rework in employees tasks on a daily basis	0.92	1.64	Low	0.91	2.34	Low	0.97	3.58	High

Table 5.
Employees' age groups and performance measures relationship

Performance measures	Chi-square	Sig	Decision
Employees hearing ability during daily activities	13.074	0.004	Reject
Employees sighting ability while work is in progress	15.126	0.007	Reject
Level at which employees get tired in the progress of work (Employees strength)	17.342	0.009	Reject
The level of employees anxiety in the progress of work	7.145	0.185	Accept
The level of punctuality to work	3.451	0.095	Accept
Frequencies of annual sick leaves	4.211	0.213	Accept
The quality/standard of employees work	9.041	0.085	Accept
Employees response time	1.067	0.685	Accept
Frequencies of employees insubordination to organization policies	1.215	0.098	Accept
Employees patience and endurance ability	0.827	0.185	Accept
Frequencies of employees request for information (RFI) on a daily basis	6.142	0.068	Accept
Frequencies of error in employees work on a daily basis	5.619	0.085	Accept
Frequencies of rework in employees tasks on a daily basis	0.741	0.087	Accept

Table 6.
Kruskal–Wallis Test on employees' performance measures

Based on the rating of the respondents on the 13 performance measures, it can be contended that two of the three age groups (groups 1 and 2) indicate effective productivity, while group 3 infers moderate or low productivity. This finding contradicts the views of Josep (2010) and Janetius *et al.* (2019). These authors argued that age and job performance may not be directly related. The authors believed that aged employees have acquired knowledge and experience over the years and may perform better than the younger ones.

Performance measures	*N*	*Z*	Sig	Decision
Employees hearing ability during daily activities	201	−1.362		Accept
Employees sighting ability while work is in progress	196	−1.416		Accept
Level at which employees get tired in the progress of work (Employees strength)	167	−0.267		Accept
The level of employees anxiety in the progress of work	196	−1.721		Accept
The level of punctuality to work	182	−1.513		Accept
Frequencies of annual sick leaves	179	−0.151		Accept
The quality/standard of employees work	205	−1.438		Accept
Employees response time	203	−1.812		Accept
Frequencies of employees insubordination to organization policies	198	−1.712		Accept
Employees patience and endurance ability	177	−0.614		Accept
Frequencies of employees request for information (RFI) on a daily basis	195	−1.712		Accept
Frequencies of error in employees work on a daily basis	202	−1.601		Accept
Frequencies of rework in employees tasks on a daily basis	194	−1.113		Accept

Table 7.
Mann–Whitney *U* test

However, based on the rating of the respondents, it can be contended that age and job performance are much related. The respondents of the study alleged that variables such as strength and hearing/sighting abilities of construction tradespeople deteriorate with age and the frequencies of their sick leaves increase. Several scholars in the reviewed literature have also considered age as a major factor that has significant effects on the organization's performance (Kunze *et al.*, 2013). Robbins and Judge (2013) pointed out that employees' agility, strength, speed and coordination deteriorate with age. Therefore, at old age, construction tradespeople jobs become boring and lack the stimulation that could lead to low performance of the organization. It should also be noted that construction tradespeople's jobs are strenuous and require strength/emotional stability that could deteriorate with age. Hence, for better workers/organization performance, more of age groups 1 and 2 tradespeople should be engaged in projects as they have the required knowledge, strength, energy, morale and mental stability that is needed for effective execution/delivery of construction projects.

4.5 Age at which performance begins to decline among construction tradespeople

The outcomes of the analysis in this section are presented in Table 7 and Figure 1 respectively.

Based on the opinions of the respondents presented in Figure 1 and the information obtained in the previous section of the study, it can be emphasized that tradespeople's performance in their daily activities will be adequate or efficient for ages between 16 and 52. Thereafter, their performance in their daily activities began to decline. This implies that employees' parameters such as hearing/sighting abilities and the like will be satisfied within these ages (around 16 to 52). Thereafter, it failed to be satisfactory specifically at above 52 years. Consequently, their performance in projects will begin to reduce. Further, the PCA presented in Table 8 indicates that there is a strong relationship between age groups 40–45, 45–50 and tradespeople's performance at p less than 0.05 2-tailed.

This implies that a positive relationship exists between these age groups and performance in construction projects. Statistically, there is a significant association between the variables (Gravetter and Wallnau, 2008; DBI, 2018). Hence, employees' hearing/sighting abilities and the like are believed to be at the apex of effective job performance in these age groups. However, at 50–55 and above, a negative relationship was observed between the age groups and tradespeople's performance. Based on the outcomes of the PCA, it can be said that performance begins to decline at 50–55. To be precise, the mean average of these age groups is 52.5 approximately 53. Therefore,

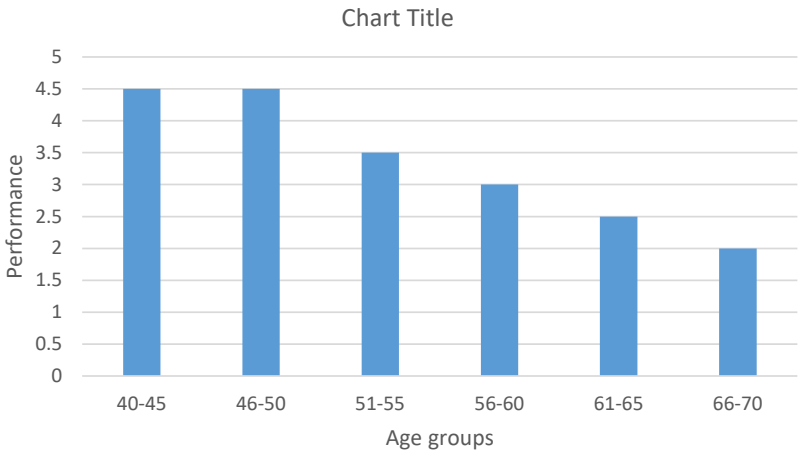

Figure 1.
Construction tradespeople age and performance decline relationship

Age groups	40–45	45–50	50–55	55–60	60–65	65–70	Performance
40–45	1.000						
Pearson's correlation Significance (two-tailed)	0.000						
N	214						
45–50	0.913	1.000					
Pearson's correlation Significance (two-tailed)	0.000	0.000					
N	214	214					
50–55	0.765	0.774	1.000				
Pearson's correlation Significance (two-tailed)	0.000	0.000	0.000				
N	214	214	214				
55–60	0.512	0.519	0.532	1.000			
Pearson's correlation Significance (two-tailed)	0.000	0.000	0.000	0.000			
N	214	214	214	214			
60–65	0.421	0.431	0.472	0.411	1.000		
Pearson's correlation Significance (two-tailed) 0.000	0.000	0.000	0.000	0.000			
N	214	214	214	214	214		
65–70	0.339	0.247	0.173	0.125	0.143	1.000	
Pearson's correlation Significance (two-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	
N	214	214	214	214	214	214	
Performance	0.971	0.818	0.673	0.411	0.351	0.253	1.000
Pearson's correlation Significance (two-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	214	214	214	214	214	214	214

Table 8.
Pearson correlation analysis table

premised on the respondent's MIS and PCA conducted, performance begins to decline among construction tradespeople at 53 years. This is less than the official 60 years of retirement age observed in the literature (Sousa *et al.*, 2019; Vranakova *et al.*, 2021).

Age and performance decline has been widely studied in sport sciences, public health and the general population with a focus on measuring performance, which is based on strength, speed,

or endurance among other factors for investigation of maximal physical capability among several participants' (Hall *et al.*, 2016). The results of most of these studies consistently reported being asymmetrical, with an early age of peak performance (i.e. before mid-life) (Berthelot *et al.*, 2019). Singh-Manoux *et al.* (2012) and several other authors have also investigated a whole-life development and decline in human functional capacity, a useful tool in assessing the complete physical and cognitive pattern with aging. Their findings were described using a positive convex hull of peak performance as a function of aging. The convex hull was found to be a continuous, asymmetrical inverted (U pattern), where the age of peak performance in all the participants of the studies occurs in the earlier part of participants' lives. Contrary to the findings of the aforementioned authors, Nassif *et al.* (2012) investigated age and performance decline in a group of athletics. Their study showed that the relationship between ages (19–91 years) and fitness have a non-linear (quadratic) decline. This could be explained by the fact that the underlying biological mechanisms leading to declining in performance affect all individuals differently subject to individual history, i.e. health and chronic diseases or personal lifestyle, smoking and alcohol intake. This implies that the age of peak performance and rate of decline can be described as heterogeneous distribution, leading to multiple ages of peak performance in a group of people (Nassif *et al.*, 2012).

It should be noted that the aforementioned authors have investigated the relationship between individual age and performance in their studies. However, their assessment focused on a broad contextual plane without particular emphasis on the construction industry/tradespeople or projects environment. Accordingly, results from the previous studies as they relate to the subject matter can be deemed to be either generic or narrow as they do not cater to point out the very age at which performance begins to decline in a comprehensive way. This is a gap that the current study contributes towards bridging as it has extended age-performance decline study/knowledge to construction workers, working across a wider spectrum of construction projects albeit within a particular geographic context. It can also be argued that the specific age at which performance begins to decline is difficult to experimentally establish in the previous studies due to individual health conditions and lifestyles. Nevertheless, the outcomes of the survey study conducted revealed that tradespeople performance in their daily tasks increases till around 53 years. Thereafter, their performance begins to decrease. This may also depend on the individual's ways of life. Therefore, this study contributes to the existing literature in the subject matter by pointing out the exact age at which tradespeople performance begins to decline in Nigerian construction projects. Obviously, this study also establishes a strategy for determining the quantity of aged tradespeople's daily tasks, which distinguishes it from the previous studies.

4.6 Measures to improve aged tradespeople's performance in construction projects

Participants of the interview study conducted argued that retrenchment of construction tradespeople at the established age (53) may not be a good option. The participants were of the view that the decision will only add to the number of unemployed citizens of the nation, which could worsen the economic situation of the country. The participants affirmed that certain strategies may be used to delay the performance decline of aged tradespeople in construction projects. For instance, some of the participants suggested that a device that can be used to establish construction tradespeople's performance based on their age should be developed. The participants contended that such a device (in the form of an age-performance meter) can be used to determine the number of tasks that will be allocated to a particular aged worker. Therefore, construction tradespeople that are 53 years and above will be allocated fewer daily tasks in comparison to the younger ones. This will enable project managers to estimate the number of tradespeople required for a particular task and also save the aged tradespeople from several challenges including health risks associated with overwork or job pressure. Based on this suggestion, some of the participants of the interview study advocated that a simple linear

regression analysis (SLRA) can serve as an age-performance meter. In SLRA, $Y = a + bx$, a is the intercept, b is the slope which can be mathematically derived. Therefore, if x is the tradespeople's age, Y which stands for performance can be mathematically established. This age-performance meter can be used to allocate tasks to a particular worker. Therefore, equal tasks will no longer be allocated to tradespeople by site managers but through the age-performance meter. Some of the participants of the study that are also good at calculus proposed integration as an age-performance meter. However, the participants pointed out that a comparison should be made between the two proposals by future researchers, whether the same results will be arrived at or one of the two methods may be easier to apply than the other.

Further, physical activities such as regular strength training exercises and an adequate nutritional lifestyle earlier observed in the literature are some of the underlying strategies that were also suggested by some of the participants of the interview study to delay workers' performance decline.

5. Study implications/limitations

5.1 Implications

Many of the previous age studies explanations show that aged workers are more beneficial to organizations than the younger ones due to their experience. However, this study reveals that young tradespeople are more beneficial than the aged one due to their strength, hearing/sighting abilities and the like. Therefore, young construction tradespeople will perform better than the aged one if given autonomy at the workplace. Further, there is no general theory that establishes the specific age at which performance begins to decline among individuals in organizations. Existing elucidations fall into related but separate categories and none of the explanations cover the aspect of construction tradespeople. This paper empirically examines an organizational theory of individual age performance decline that bridges the gap in the existing explanations. The central point of the theory is that tradespeople performances reduce with age in construction projects. Therefore, this study is important as it enables construction managers to have an adequate understanding of the negative influence of old age on project performance. The study is also important as it enables project managers to determine the number of jobs that should be allocated to aged tradespeople for effective daily output. This will safeguard their health, increase projects performance and the performance of the construction industry at large. Therefore, construction firms specifically in the study context should redesign their policy in the recruitment process, so as to enable them to always recruit from the age range of 16–52 and stop retiring employees within this group. This will consequently curb the skills gap that is prevalent in the global construction industry. It is also suggested that the Nigerian construction industry should focus attention on the essential strategies that can be used to reduce the performance decline of aged tradespeople, as they are the main available workers in the context.

5.2 Limitations

Like other studies, the present study has certain limitations and suggestions for further research. Firstly, the outcomes of the study are strictly based on the data collected from tradespeople working on different construction sites in Abuja, Nigeria only. Therefore, the outcomes of the study can be applied in other production/manufacturing industries of Nigeria.

Secondly, the study was conducted in Abuja, the capital city of Nigeria. To generalize the findings of the study, similar research may be conducted in other countries (developed and developing) such as the capital city of Ghana and the UK where different construction projects may also be going on regularly.

6. Conclusion

Based on the literature and the findings of this study, it can be concluded that three age groups of tradespeople exist in the construction industry of Nigeria namely, group 1 (16–30),

group 2 (31–45) and group 3 (46–58). With the exception of group 3, it can be emphasized that the age groups of tradespeople in the construction industry are within their active years. However, all the age groups discovered in the study are less than the official retirement age of 60 years. Group 3 is more in number than groups 1 and 2 due to the perception that the tradespeople in the group are more experienced than the other two groups, or due to a shortage of skilled and young artesans in the construction industry. In terms of performance, the tradespeople in groups 1 and 2 passed almost all the performance measures tests due to their strength, energy, morale and mental stability and can be said to be more effective than group 3 in daily tasks. This infers that groups 1 and 2 indicate more effective productivity than group 3. Therefore, for better performance of construction tradespeople in projects, the number of groups 1 and 2 to be recruited should be more than group 3. It can also be said that the performance of tradespeople in the construction industry increases between the ages of 16–52. At 53 years, their performance in projects begins to decrease. This can have a serious negative effect on the daily outputs of the tradespeople and that of the industry at large.

Premised on the research conclusion, construction tradespeople should be educated on their daily nutrition lives and be advised not to take alcoholic drinks or substances. They may also be placed under closer watch or monitoring by their employers for effective results. The study also recommends that construction firms should not retire the aged tradespeople, but advised recruiting from ages range of 16–52 as performance seems to decline from 53 years and above. This would nonetheless curb the problem of the skill gap in the industry as the older ones would stay long enough to transfer their experience to the younger ones before they retired. The study also recommends that managers should recruit more tradespeople within the age groups 1 and 2 than age group 3 in every project. In addition, the study recommends age-performance meters proposed in this study to measure the quantity of daily work that will be executed by aged tradespeople. This is essential as it will enable project managers to know the exact number of aged tradespeople required for a particular task. Consequently, the aged tradespeople will not be over-stressed while trying to complete their daily tasks. Hence, reduce the rate of the explosion of aged tradespeople to certain health risks due to work pressure.

The literature shows that aged and young-age employees are equally important for the growth and development of an organization. Therefore, a model for estimating the numbers of aged and young tradespeople required for a particular task in projects should be developed by future researchers. Further study on comparative analysis of the applicability of the proposed age-performance meters (SLRA and calculus) are also recommended for future researchers, so as to establish the one that will be more suitable to apply in projects.

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