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# An Automated Age prediction model for Human Resource Development

Emmanuel Ukekwe[1], George Okereke (P.hD)[2], Honor Nwagwu (P.hD)[3]
[1]*Department of Computer Science University of Nigeria, Nsukka*
[2]*Department of Computer Science niversity of Nigeria, Nsukka*
[3]*Department of Computer Science University of Nigeria, Nsukka*
*Corresponding Author: Emmanuel Ukekwe*

***Abstract:*** *Age falsification in labour is a global challenge which adversely affects Civil Service productivity especially in third world countries. The Nigerian labour force for instance is filled with senile and over aged employees due to falsified age. This continues to affect production adversely in our institutions, establishments and businesses. This paper presents a model for solving the menace of age falsification in Nigerian Civil service. The model predicts employees' age using the dates on the employee's certificates. The duration period from primary to tertiary is used to predict the actual age taking into cognizance the waiting/delay periods between transition points. The model is based on the Nigerian system of education 6-3-3-4. A data set of student applicants was created for the purpose of the research. An inferential research was carried out on the data set using Mann-Whitney test statistic to show that there is indeed a diaprity between the quoted age of employees and their real age as predicted by the model. A 3.72% disparity was observed based on the data set used. An online automated application was developed (www.agepredictor.eu5.net) using PHP programming language and MYSQL database to demonstrate the efficacy of the model. The application could be used as a tool by Human resource units and agencies in recruitment.*

***Keywords:*** *Recruitment, Labour, Human Capital Values,* Age-falsification, Age-Verification

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## I. Introduction

Age falsification in Civil service adversely affects the labour force and consequently reduces the productivity of any establishment, institution or firm. Labour is a paramount factor of production which needs to be taken seriously. It is no secret that progressive economies thrive well under competent labour force. There is no doubt that the success or failure of every business venture is largely dependent on the labour force. Rob and Geoff (2004) view competence in labour as fundamental source of economic productivity. Competent labour initiates progressive ideas and physically executes them in every establishment. Some businesses or establishments that do not have competent labour continue to seek the help of foreign expatriates on developmental issues. This endeavour is usually capital intensive. A lot of small scale businesses and establishments had been run down due to incompetent labour force. These establishments do not have employees with Human Capital values (HCV) that could move them forward. Kwon (2009) defines human capital values in economic terms as the salient talents inherent in an individual which have the propensity of generating wealth. The role and impact of HCV in establishments cannot be emphasized. Maran et al (2009) see HCV as a good competitive advantage that will enhance higher performance. Similarly, according to Mohammad (2016), human resources is said to have the greatest importance in gaining sustainable competitive advantage over other firms. Human capital is a phenomenon that reconciles the current requirements for increasing performance, competitiveness, and sustainability with requirements for a high level of expertise in information technology area of employees who are working in e-business (Alžbeta, Martin & Miloš, 2018). It is these capital values that every establishment or firm usually seek in their employees because it is these abilities that culminates to profit or loss in economic terms for such establishments. It could be said therefore that the human capital values in a person determines the investment propensity of such person. Typical examples of HCV collection of resources include all the knowledge, talents, skills, abilities, experience, intelligence, training, judgment, and wisdom possessed by an individual. Research has shown that age is also a paramount HCV that should not be ignored. In as much as skills, IQ, talents and experience are positive human capital values sought for in employees, age is also another value that should be taken seriously. Wonderful and intelligent ideas can only be executed by exerting physical and mental efforts. As an employee continues to age, health challenges continue to increase. The number of sick leave begins to rise due to age. No establishment strives well if employees on sensitive tasks continue to be bedridden. A sick employee continues to be exempted

from duties and is usually made to avoid strenuous tasks. This negatively impacts on the production output of such establishments. Apart from keeping employees away from work often, health issues relating to age do not provide employees with the stamina to do the job or cope with the associated demands even when the employee is on seat.

Age as a human capital value should be considered before engaging a new employee into a productive labour. Okonkwo (2014) avows that for the public Civil service to achieve its aims there is the need for a set of rules and code of conduct to be put in place so that services can be delivered effectively and efficiently. Every Civil service has its working and retirement age. The Nigerian Civil service is a productive sector of the Government that requires productive labour. According to Rahmah (2010), the vision of Malaysia is to become a developed nation by 2020 by ensuring a workforce that has high performance and capability to drive the nation's growth and development. This ought to be the vision of Nigeria too especially as it concerns our civil service. Ezeibe & Iwuoha (2011) list integrity as one of the normative values of public servant. Unfortunately, this normative value is not popular in our civil service as the labour force is characterized by age falsification. Indeed age falsification is part of the corruption existing within the civil service (Edikan, & Emem, 2008; Sokoh, 2017; Oluwaseun, 2015). Recently, an article in Sahara Reporters (2019) reports that Acting Chief Justice of Nigeria has been dragged to court over alleged age falsification. In addition, another article in Punch Newspaper (2019) reports about Court dismissal of suit on certificate forgery and age falsification.

This habit has become a popular trend in Nigerian civil service and ought to be addressed. A lot of employees under civil service are working with falsified age certificates. They excuse their crime under the slogan "retired but still strong". In Nigeria, the fear of retirement has been attributed to the major reason why people falsify their age. This is supported by (Jaja, 2012; Ginikachi, 2018; Nweke, 2016) who also view retirement as a major catalyst fuelling age falsification in Nigeria. This is so because the after retirement package and policies in the country is nothing to be proud of. Part of the challenges includes finding a reliable pension trust firm. Another challenge is that government usually does not release money for the monthly pension due to retirees. There is indeed reason to believe that Nigerian pension scheme is still facing some challenges (Uzo, 2018; Ahmed, 2006; Ali, 2014).

One of the efforts at checking age falsification by government is the introduction of Personnel Payroll Information System (IPPIS). According to Omeiza (2015), the cancer of age falsification will soon be a thing of the past with introduction of IPPIS. The government of Edo state recently took a bold step to dismiss 3,000 civil servants in the state who were found guilty of falsification of age and forgery (Nzemeke, 2014). Even after these efforts, over-aged workers still abound within our Civil service. In light of the foregoing, one can say that the Nigerian government is not doing enough in checking this disease which is threatening to engulf her civil service. The government is yet to come up with an adequate tool for combating this malady.

## II. Statement of the Problem

Some of the peculiar challenges inherent in the Nigerian civil service include:

**a No adequate tool/procedure for ascertaining applicants' age before recruitment in real time**

Measurement of human age in real time computing system is a difficult task. This is because such measurements usually require sample culture for laboratory experiments. Such experiments require several days before proper analysis, results and interpretation. There are other laboratory experiments that could be used for ascertaining an individual's age. Such experiments include blood tests, automatic nervous system (ANS) and others (Pam, 2015; Maximilian, 2016; Dvorak, 2017). Unfortunately, these tests also take sample and require some time for interpretation. In addition, they also require the use of sophisticated medical tools which may not be available. As a result, these tools cannot be used to ascertain one's age in real time.

Human age can also be measured using physiological methods. Such methods include balance tests, pinch tests and skin elasticity tests (Kekich, 2013; TG Doctor, 2011). Unfortunately, these tests fall short of expectations because they usually do not produce accurate and reliable results due to the instrument used and the method of application. In some cases, the subject may not have fully adhered to the requirements for accurate measurement to take place. Some also argue that the physiological mood of the person whose age is being measured can also influence the results. For example, the pinch test simply measures the time it takes for one's skin to return to its normal form after being pinched. The yardstick of measurement is based on the fact that older skins usually take more time to return to normal than younger ones. This approach usually does not produce consistent results.

**Figure 1:** The Pinch Test Figure 2.1.7a: The Pinch Test
**Source:** **http://evewaspartiallyright.blogspot.com.ng/2011/10/are-you-dehydrated-you-might-be.html**

Another physiological approach that measures human age is the balance test. Balance is just the ability to stay upright or stay in control of one's body movement at least for some time when subjected to an abnormal stance or body position. Research has shown that balance impediments are common among people with trauma, stroke, head injury and others. These sicknesses unfortunately are also regarded as age related sicknesses. Balance tests are known to measure longevity because the ability to maintain balance diminishes with age. Balance tests require the subject to stay upright, either on one foot or on the ball of a foot and with closed eyes. Such test simply measures one's ability to maintain a static constant equilibrium for some time.

**Figure 2:** The Balance Test
Source: https://www.medgadget.com/2013/11/mobilemat-bess.html

Balance test results like the counterparts are also not as reliable as expected because the results are usually influenced by the person's health condition and possible Impediments.

**b. Government efforts at curbing age falsification is not effective**

One of the existing efforts by government to fight age falsification is through staff auditing and verification. Staff auditing requires every staff in civil service to present themselves for interviewing and verification. The exercise also includes verification of present and old certificates acquired by the employees. These exercises apart from taking place occasionally are also seen as a mock means of justifying expenditure, siphoning funds and a mere routine government check. In addition, they usually involve a cursory look at certificates especially birth certificates without a thorough check. The number of staff to be verified is usually too large and the time allotted for the exercise is also very short. As a result, the whole exercise is not usually as effective as it ought to be.

Another existing attempt at checking age falsification is the introduction of IPPIS. The era of grey-haired and old public officers still active in service, claiming not to have reached the retirement age will soon be over with the introduction of the new scheme Omeiza (2015). The scheme was introduced by Nigerian government as an innovative idea which is meant to ensure a uniform payment scheme, pension, addressing ghost workers, retirement benefits including age of retirement and others. The system is designed to unify all civil service sectors to have one database. Unfortunately, the scheme has not been accepted in many government institutions. The education sector is yet to fully implement the scheme while some unions continue to fight the implementation. In places where the scheme had been successfully implemented, the major success recorded so far in in identifying ghost workers (Idris , 2015; Effiong, 2017; Leyira, 2018; Agboola, 2018).

**2.1. Implications**

Implications arising from the stated problems include:

**a. Dependence on Quoted Date of Birth or Affidavits**

Due to unavailability of an effective tool for ascertaining employees' age, the human resource and recruitment agencies are solely dependent on the quoted age in the curriculum vitae and age declaration affidavits. In some establishments, an employee is first given a temporary appointment, during regularization exercise, the employee's birth and academic certificates are then verified. This approach is more like a Post-Verification of date of birth certificate. The Post-Verification approach encourages falsification of age and cannot be accepted as a viable means of measuring employees' age.

**b. Falsification of age to extend retirement date**

Government employees continue to alter and falsify their retirement age through collaboration of staff members working under the personnel unit of such establishments. For this reason, the labour force is filled with senile and physically weak employees who find it difficult to cope with the rigors and challenges of the job.

## III. Research Aim and Objectives

The major aim of this paper therefore is to develop a Pre-verification approach to measuring employees' age in real time computing. The specific objectives are:

i. To develop a model that uses the quoted age on employees' certificate to predict their actual age
ii. To develop a cloud application that automates the model in real time computing
iii. To apply the developed model to a given population sample

**3.1 Research Questions**

a. How can likely discrepancy between quoted and predicted age be identified?
Hypothesis:

$H_0$ : There is no discrepancy between the quoted and the predicted age of employees

Vs

$H_1$ : There is discrepancy between the quoted and the predicted age of employees

b. What is the percentage difference between the model predicted age and the quoted certificate age?

## IV. The Proposed System Methodology

The proposed system presents a model for predicting employees' age using the existing Nigerian education system (6-3-3-4). The model is subsequently automated and provided as a cloud service.

**4.1 Model Formulation**

The proposed model uses the certificate date of individuals to predict their actual age without depending on their curriculum vitae's quoted age. The Nigerian system of education (6-3-3-4) presumes that every student under her education system spends 6 years in primary school starting at the age of 6 years, 3 years in junior secondary, 3 years in senior secondary and 4 years in tertiary education. Since the mature age for someone to be admitted into nursery school is known before hand, it is possible therefore to use the certificate date to predict an applicant's. In order to understand the proposed model, the following terminologies are presented:

a. **Certificate Age** :- This is the predicted employees' age arising from the model. It is a combination of primary, secondary, tertiary and post tertiary years spent in school evident on the certificates obtained. Mathematically we state thus:

Certificate Age = Duration of Primary education + Duration of secondary education + Duration of tertiary education age + Duration after tertiary education……3.1a

b. **Duration of Primary Education (DPE)** :- This is made up of time spent before primary school and the time spent in primary school education. It is mathematically given as:

$DPE = BP_d + PE_d$ (where $BP_d = PE_d$ which is approximately 6 years respectively) …….3.1b

Where $BP_d$ = duration before primary education and $PE_d$ = duration of primary education

c. **Duration of Secondary Education (DSE)** :- This is the total duration before secondary education ($BS_d$) and the duration of secondary education ($SE_d$). Mathematically we state:

$DSE = BS_d + SE_d$ (where $BS_d = SA_y - PG_y$, $SE_d = SG_y - SA_y$) …….3.13c

Where;

$BS_d$ = duration before secondary education
$SE_d$ = duration during secondary education
$SA_y$ = secondary admission year (input data)
$PG_y$ = primary graduation year (input data)
$SG_y$ = secondary graduation year (input data)
Input data = Responses received from the employees' certificate dates.

d. **Duration of Tertiary Education (DTE)**:- The DTE is the time duration before tertiary education ($BT_d$) and the duration of tertiary education ($TE_d$) for an employee. It is stated thus:

$DTE = BT_d + TE_d$ (where $BT_d = TA_y - SG_y$, $TE_d = TG_y - TA_y$) ……..3.1d

Where;
$BT_d$ = duration before tertiary education
$TE_d$ = duration during tertiary education
$TA_y$ = tertiary admission year (input data)
$TG_y$ = tertiary graduation year (input data)

e. **Duration After Tertiary (DAT):-** This represents the years elapsed after tertiary education**.** It is computed as follows:

$DAT = C_y - TG_y$ ……..……..…3.1e

Where:
$C_y$ = current year (an input from computer calendar)

The proposed system for measuring certificate age requires input data response for $SA_y$ , $PG_y$, $SG_y$, $TA_y$ and $TG_y$ which is collected through a computer form.

### 4.2 The Proposed System Model

The predictive model is given in Figure 3.

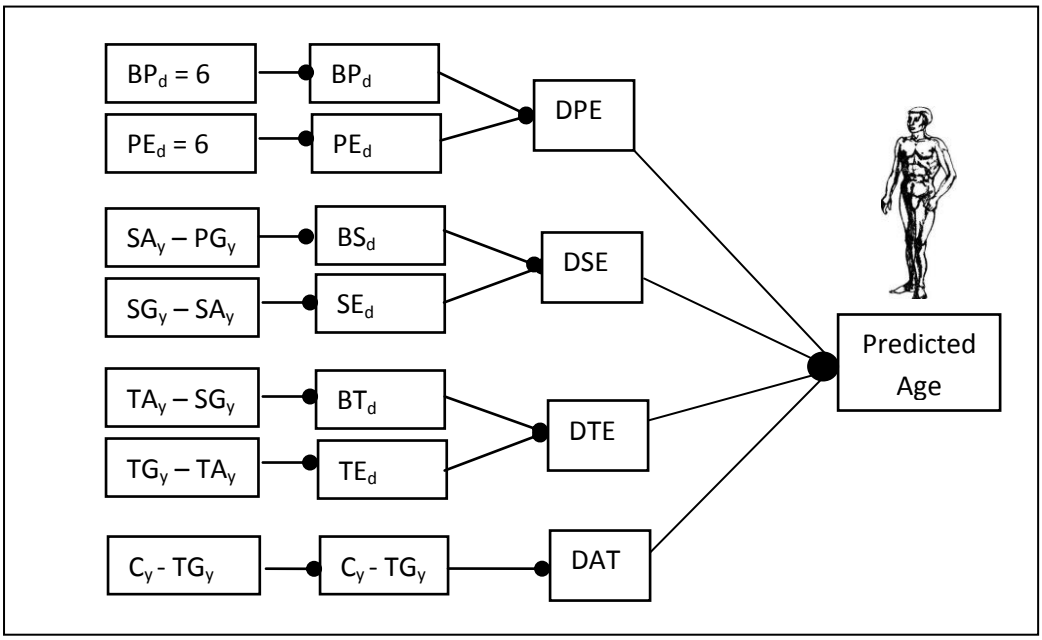


**Figure 3:** Conceptual Model for Predicting Employees' age

### 4.3 System Use Case Design

The system is designed to be used by the Human Resource unit or any other Government agency responsible for verification of employees' age. The system therefore makes use of a single actor as shown in Figure 4.

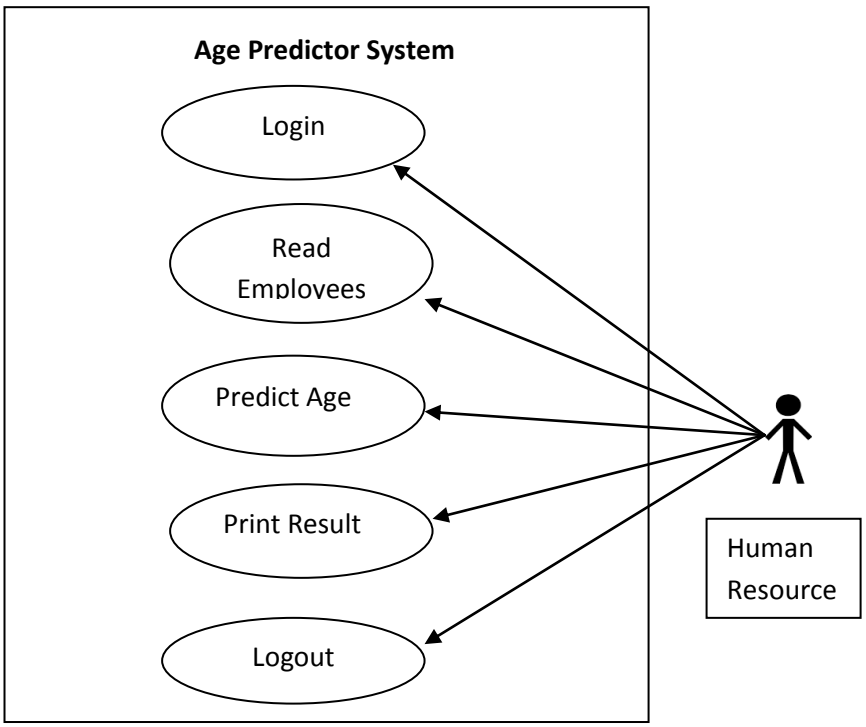


**Figure 4:** Use Case Design of the Ape Predictor System

### 4.4 System Implementation

The model is implemented as an online application for human resource units and recruitment agencies. It is to be used by these agencies in a real time. This means that during interviews or tests for applicants, the test administrator could log into this site and predict the actual age of intended employees rather than depend on the age supplied by the candidates' curriculum vitae. The system requires six (6) input variables which used to predict the certificate age of an intended employee.

### 4.5 Software Implementation Architecture

The implementation architecture is a three tier process comprising of the presentation tier, the middle tier and the data tier. The presentation tier was developed using HTML and CSS codes. The middle tier is the programming tier and the data tier is the database. The essence of the database is to store results of a successful prediction under a stipulated an administrator ID. The diagram in Figure 5 summarizes the implementation architecture.

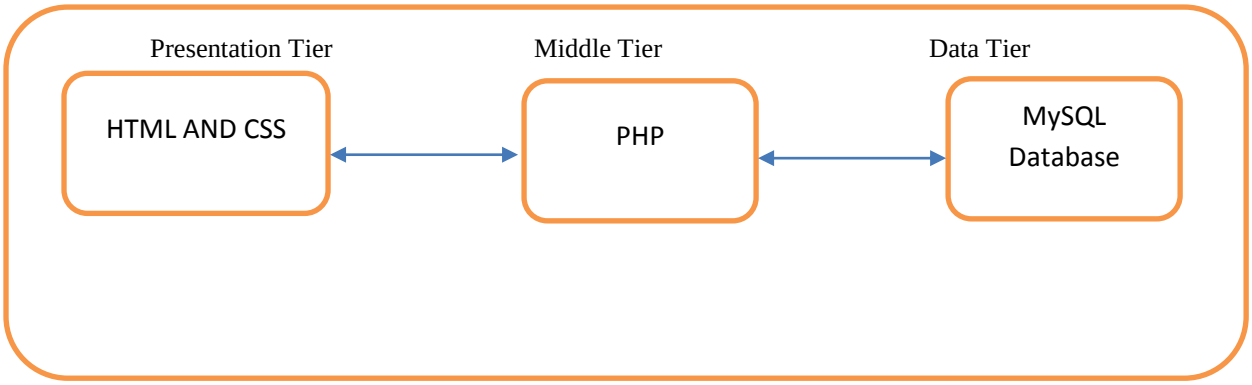


**Figure 5:** System Implementation Architecture

### 4.6 System Deployment

The model is automated and deployed as a cloud application in (*www.agepredictor.eu5.net*). The deployment architecture is given in Figure 6.

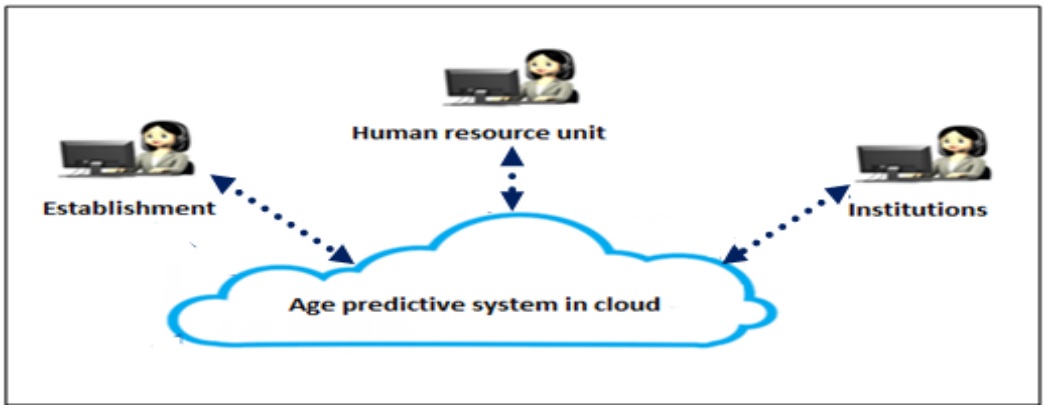


**Figure 6:** Deployment Architecture of the Age Predictive System

## V. Research Methodology

This paper adopts a quantitative research using an inferential approach to analyze the data. The data used for this paper was collected from the office of the Admission Officer, Department of Computer Science, University of Nigeria, Nsukka. A data set ($3^{rd}$ and $4^{th}$ year) of the department was created for the purpose of this research. The date of birth, primary school graduation year, secondary school admission year, secondary school graduation year, tertiary admission year and tertiary graduation year were extracted from their bio-data files domiciled in the Department. The purpose of the students' data set is to find out if intended applicants going into the labour market have tendencies of falsifying their age. If the students falsify their age, then it is enough evidence to show that the labour force is filled with employees working on falsified age. The data set is presented in Table 1.

**Table 1:** Results showing the Model Predicted and the Quoted Age

| S/N | ID. No | pgy | say | sgy | tay | tgy | Predicted Yr.of.Birth | Yr. of birth on Certificate | Predicted Age (Yrs) | Age on Certificate | Deviation in Age |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2012/181240 | 2006 | 2006 | 2012 | 2012 | 2019 | 1994 | 1994 | 25 | 23 | 2 |
| 2 | 2015/197292 | 2008 | 2008 | 2014 | 2015 | 2019 | 1996 | 1997 | 23 | 22 | 1 |
| 3 | 2015/202256 | 2005 | 2005 | 2011 | 2015 | 2019 | 1993 | 1994 | 26 | 25 | 1 |
| 4 | 2015/198134 | 2009 | 2009 | 2015 | 2015 | 2019 | 1997 | 1999 | 22 | 20 | 2 |
| 5 | 2015/198156 | 2004 | 2004 | 2011 | 2015 | 2019 | 1992 | 1995 | 27 | 24 | 3 |
| 6 | 2015/197225 | 2008 | 2008 | 2014 | 2015 | 2019 | 1996 | 1999 | 23 | 20 | 3 |
| 7 | 2015/197395 | 2008 | 2008 | 2014 | 2015 | 2019 | 1996 | 1996 | 23 | 23 | 0 |
| 8 | 2015/199518 | 2007 | 2007 | 2013 | 2015 | 2019 | 1995 | 1997 | 24 | 22 | 2 |
| 9 | 2013/188408 | 2005 | 2006 | 2011 | 2013 | 2019 | 1993 | 1993 | 26 | 20 | 6 |
| 10 | 2015/204012 | 2009 | 2009 | 2015 | 2015 | 2019 | 1997 | 1997 | 22 | 21 | 1 |
| . | . | . | . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . |
| 186 | 2016/232819 | 2009 | 2009 | 2015 | 2016 | 2020 | 1997 | 1997 | 22 | 22 | 0 |

### 5.1 Test Statistic

In order to answer the research question 1, which seeks to test for a discrepancy between the quoted and the model predicted age of student applicants, a normality test was carried out on the data set using SPSS software. The data set failed a normality test as shown in figure 7.

**Tests of Normality**

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| Age | .171 | 372 | .000 | .918 | 372 | .000 |

a. Lilliefors Significance Correction

**Figure 7:** Result of Normality test on data set

From figure 7, it could be seen that the Shapiro-Wilk test reported a significance of 0.000 which is lower than our *p* value 0.05 and this violates the normality test. As a result of this, a non parametric approach was adopted in the test. The Mann-Whitney test statistics was used to carry out a 2-independent samples test on the data set. The result of the test is shown in figure 8.

**Mann-Whitney**

**Ranks**

| | Method | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| Age | Model_Predicted | 186 | 200.67 | 37324.00 |
| | Certificate | 186 | 172.33 | 32054.00 |
| | Total | 372 | | |

**Test Statistics[a]**

| | Age |
|---|---|
| Mann-Whitney U | 1.466E4 |
| Wilcoxon W | 3.205E4 |
| Z | -2.575 |
| Asymp. Sig. (2-tailed) | .010 |

a. Grouping Variable: Method

**Figure 8:** Result of Mann-Whitney Test of Independence

Similarly, in order to answer the second research question. From Table 1, the percentage efficiency of the model in predicting employees' age accurately could be calculated using equation 1 as follows:

$$\textbf{Percentage difference} = \left(\frac{\sum_{i=1}^{186} D_i}{(\sum_{i=1}^{186} P\_age_i + \sum_{i=1}^{186} C\_age_i)/2}\right) \times \frac{100}{1} \quad \text{.....(Eq.1)}$$

Where P_age and C_age represents the predicted and the Certificate age respectively and D represents the deviation.

Applying Eq.1 on the data, we have,

$$\text{Percentage difference} = \left(\frac{160}{4300}\right) \times 100$$

We obtain a percentage difference as 3.72% which exists between the model predicted age and the quoted certificate age based on the data set.

### 5.2 Interpretation of Result

In answering research question 1, it could be seen from figure 9 that the asymptotic significance for a 2-tailed test using Mann-Whitney test statistics reports a significance of 0.10 against 0.05. Based on this, we reject the null hypothesis and accept the alternative which says that there is indeed some discrepancy in age based on the model predicted and the quoted age of students. Similarly, in answering research question 2, we obtained a 3.72% disparity between the model predicted and the quoted age of the students. This figure shows that although the percentage difference is small, there is indeed evidence of age falsification among the

intending applicants for employment. The implication is that if the already employees are subjected to the model, it will obviously result to a greater percentage disparity.
Figure 9 shows a line graph depicting the disparity between the model predicted and the quoted age.

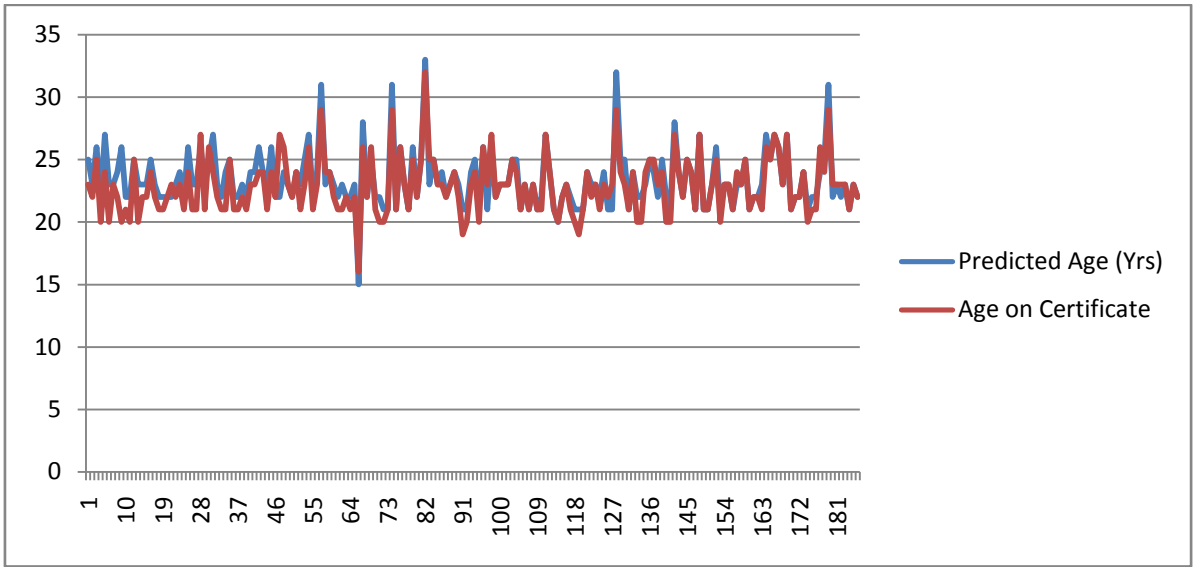


**Figure 9:** Disparity Line Graph of the two methods

## VI. Conclusion

The research shows that there is indeed evidence of age falsification in Nigerian Civil service based on the data set used. This is evident in the percentage disparity between the model predicted and the quoted age. The Human resource unit depends heavily on the quoted age from curriculum vitae of applicants. This had continued to increase the number of employees in the service working with falsified age. The implication is that our Civil service labour force is senile and may not be producing the desired optimal output. For this reason, production is being hindered to a great extent. Human resource units and recruitment agencies should therefore adopt this model in order to produce more vibrant and physically sound workforce for the establishments, companies, institutions and business ventures in Nigeria. This will go a long way in contributing to positively to Nigerian economy because of the boosted production capabilities.

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