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A Mathematical Model for Estimating an Intelligence Quotient (IQ) of Retiree and Humans above 65 Years (A Study of Federal University Wukari Community Members of Nigeria)

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Abstract: The research is concerned with the development of a mathematical model for estimating Intelligent Quotient of human above 65years. The model was optimized to know whether we have maximum or minimum human IQ level. However, the optimization result showed a saddled point which indicates that there is no minimum or maximum human IQ in life. This result implies that there is no particular IQ level that any human above 65years cannot attain when there is an enabling environment for adult education and other adult related trainings geared towards sharpening IQ skills of our retired and aged people. Similarly the IQ model was also validated with data from real life. And the outcome of the validation gave a correlation coefficient of 0.990405. This implies that our model is approximately 99% in agreement with real life data used, thus shows that the model is a standard measure for estimating IQ of human above 65years.

Index Terms: Intelligence Quotient, Mathematical Model, Adult IQ, Optimization.

1. Introduction

Intelligence may be narrowly defined as the capacity to acquire knowledge and understanding which can be used in different novel situations. It is this ability or capacity, which enables the individual to deal with real situations and profit intellectually from sensory experience [1,2]. A test of intelligence is designed to formally study human performance. Under test conditions, the success of an individual in adapting to a specific situation is recorded. There are a number of different methods which purport to measure intelligence, the most famous of which is the Intelligence Quotient or IQ test. In the formation of such tests, many psychologists treat intelligence as a general ability operating as a common factor in a wide variety of aptitudes.

Nevertheless, during the past 25–30 years IQ testing, in tandem with personality profile testing, has been brought into widespread use by employers because of the need to ensure they place the right people in the right job at the outset. One of the main reasons for this is the high cost of errors in today's world of tight budgets and reduced profit margins. To recruit a new member of staff, an employer has to advertise, consider each application; reduce the applicants to a shortlist, interview and then train the successful applicant. If the wrong hiring choice has been made, the whole expensive process has to be repeated [1,2].

In this study, we focus on the concept of intelligence and draw on IQ data. The meaning of the term intelligence and the validity and reliability of IQ tests have been subject to criticism. For instance, the researcher [2] has proposed that there are different kinds of intelligence, such as emotional intelligence. However, these can alternatively be considered personality traits rather than forms of intelligence. Criticisms have also been levelled against IQ tests [3]. However, IQ tests have been found to have high predictive validity for school achievement [4], the results correlate with objective measures such as simple reaction times which shows positivity [4]. The finding reads that individuals who perform at an above-average level on linguistic tasks also perform well on spatial and mathematical tasks [5,6]. Similarly, researcher [7] estimated the IQ of countries using data from various sources. These IQ estimates have proven useful in the prediction of nation's wealth. This paper seeks to offer an estimate of state IQ and to discuss strengths and limitations of the estimate. In addition, the paper seeks to evaluate the extent to which estimated state IQ has relationships with other state variables from the disciplines of economics, public health, criminal justice, and political science.

Finally, the paper offers a research agenda for improving the estimates of state IQ and for understanding the role of IQ in predicting other important state variables. State level data are frequently collected on a wide range of variables and are used for multiple purposes [7,8]. The fact that IQ tests measure your ability to understand ideas and not the quantity of your knowledge, learning new information does not automatically increase your IQ. Learning may exercise your mind, however, which could help you to develop greater cognitive skills, but scientists do not fully understand this relationship. The connection between learning and mental ability is still largely unknown, as the workings of the brain and the nature of intellectual ability. Intellectual ability does seem to depend more on genetic factors than on environmental factors, but most experts agree that environment plays some significant role in its development.

A lot of critics point out that IQ tests don't measure creativity, social skills, wisdom, acquired abilities or a host of other things we consider to be aspects of intelligence. The value of IQ tests is that they measure general cognitive ability, which has been proven to be a fairly accurate indicator of intellectual potential. There is a high positive correlation between IQ and success in school and work place, but there are many cases where IQ and success do not coincide. [2,9]. Another possibility that may increase the average IQ score over generations may be the effects of technology and the demand that technological devices impose on people. In viral areas of human, Children are increasingly exposed to technology, which poses unique problems that may increase abstract problem solving ability and pattern recognition. Elderly people often have difficulty learning how to use a personal computer, whereas a young person may find computers very intuitive and easy to operate. When a person is young, he or she has an increased capacity to learn new things. This has been shown in countless studies about the benefits of head start programs sponsored by government. Perhaps early exposure to technology-oriented interfaces increases a child's ability to adapt and understand complex and abstract problems.

Flynn's studies show that there is a much greater increase in non-verbal problem solving ability than word-oriented test scores. This would support the theory that childhood interface exposure increases pattern recognition and abstract problem solving ability. Complex interfaces are a problem with which only recent generations have had to deal with and this would explain the reason for the Flynn effect's recent appearance. As the everyday use of technology increases, it is reasonable to assume that the average IQ of an individual will increase as well. This will likely level off in the coming 50 years as the increase of incorporation of technology into everyday life reaches its high watermark [10,11].

However, more insight on teenagers IQ than aged people of 65 years do explain the increase in IQ scores of children recently , both physically and mentally, than children did decades ago [12]. Presently, children score higher, not because their real intelligence has increased, but because their brains are more mature. A 10 year old today has a brain that has grown faster and has more neural connections than the brain of a 10 year old who lived decades ago. Cognitive deduction proves that in such children, real intelligence has not increased, rather was just acquired, and adult people today may actually be less intelligent than fully mature people were decades ago [12].

Evaluating the role of education, and continuous learning to IQ development produces strong mind and increase competency in every sector of life. A show of IQ test using a field of study that involve critical thinking gives light to teenage IQ and most field considered by researchers is mathematics amidst others. Despite the importance of mathematics to the nation, a review of the performance in both internal and external examinations has revealed a disturbing picture. Students are seen to perform poorly in most mathematics examinations. This is giving grave concern to educators, parents, students, school administrators and the general public. Probability has it that the West African Examination Council results of students in Nigeria show that students perform poorly. In the years 2008, 2009, 2010 and 2011 the percentage pass with credit and above in Nigeria were 23.0%, 31.0%, 24.94% and 38.98% respectively [13,14,15]. One of the factors adduced to this is the Intelligence Quotient (IQ) of the student. The level of IQ has been shown to be a predictor of the level of academic achievement of students in all subjects including mathematics, but in this century, intelligence and success are not viewed the same way they were before, [16]. New theories of intelligence have been introduced and are gradually replacing the traditional theory. The whole child/student has become the centre of concern, not only his reasoning capacities, but also his creativity, emotions and interpersonal skills. Other types of IQ which contribute to the research findings are the multiple intelligence theory [2], Emotional intelligence theory [16,17]. IQ alone is no more the only measure for success; emotional intelligence, social intelligence, and luck also play a big role in a person's success [16, 17,18].

General intelligence may have become universally important in modern life only because our current environment is almost entirely evolutionarily novel. The new theory suggests, and empirical data confirm, that more intelligent individuals are better than less intelligent individuals at solving problems only if they are evolutionarily novel but that more intelligent individuals are not better than less intelligent individuals at solving evolutionarily familiar problems, such as those in the domains of mating, parenting and interpersonal relationships [19].

The IQ of adulthood or over-aged people is then regarded not significant as other effect of aging and memory effect set in. The level of IQ of youth or teenage mostly determine the IQ of such individual when old even when is 65years [20]. Factor like environment, educational level, training, individual differences of person prior to time also affect or promote IQ level [21,22]. The matching of aged IQ examined shows a declining rate to that of teenage as time goes on. Considering the declining effect of IQ on aged people, the contributions of the aged, retired and above 65 years has always been ignored in Nigeria before now, but it is hopeful that this study, based on the IQ output of the aged person in the research sampled area should be gratified. It should be to an extend that for every job advertisement, some

major and sensitive percent would be reserved for this class of people above 65 years of age, while grant for workshops and seminar should be attended for evaluation and learning purposes.

1.1 Contribution to Research Work

- Retiree are some-way neglected after service, which makes them feel unfulfilled, marginalised, ridiculed and unproductive even by the same system they had render service.
- However, there are more potentials, experience and skills to workmanship that retirees possess, that can be useful or impacted into their world. Inspite of the fact that they are not among the workforce, knowledge, experience and direction is a key factor to workforce.
- Hence the model shows the declining rate of IQ of retirees when underutilised, also the impact of the society or environment on them.
- The work stands to encourage the effective use of retirees
- Governmental agencies should discourage inappropriate placement of retirees as though not needed in the society. Also, in order to improve their IQ and competency level, NGOs and governmental services on time basis for rejuvenation should be implemented. Services like; seminar, workshops, grant-offer- programme, skill evaluation are retained in partial sectors that are less tasked.

2. Methodology

This section of the research work is subdivided into two aspects, which are; model formulation and data description for proper elaboration.

2.1 Formulation of the Model Equations

To create the research model equation, we considered some measurable parameters that strongly influence intelligence quotient and the mathematical relationship between model and the parameters. Thus major parameters are;

- **Chronological Age (C_A):** Chronological age refers to the actual amount of time a person has been alive. The number of days, months, or years a person has been alive which does not change regardless of how healthy a lifestyle (even one filled with great exercise and nutrition habits) they are living.
- **Mental Age (M_A):** it is the level of native mental ability or capacity of an individual, usually as determined by an intelligence test, in relation to the chronological age of the average individual at that level. A ten-year-old child with the mental age of a twelve-year-old; a mental age of twelve.

However, under this section, we employ the basic assumptions needed to give us a model that conforms to reality, which lead to the model formulation.

2.1.1Model Assumptions

2.1.2 Intelligent Quotient (I_Q) versus Chronological Age (C_A) of the aged humans

It is then observed that as man become old and very old, his IQ tends to drop. That is, increase in age (C_A) will lead to decrease in I_Q. Hence, I_Q is inversely proportional to C_A.Thus mathematically,

$$\therefore = I_Q \; a \; \frac{1}{C_A} \tag{1}$$

$$\therefore I_Q = \frac{K_1}{C_A} \tag{2}$$

2.1.3 Intelligent Quotient (I_Q) versus Chronological Age (C_A) and Mental Age (M_A) of the aged humans

Similarly, human I_Q is directly proportional to his mental Age (M_A) and inversely proportional to his Chronological Age (C_A).

Thus mathematically,

$$I_Q \; a \; \frac{M_A}{C_A} \tag{3}$$

$$I_Q = \frac{K_2 M_A}{C_A} \tag{4}$$

2.1.4 Establishment of model parameter relationship

Combining equations (2) and (4) gives,

$$I_Q = \frac{K_1{}^*}{C_A} + \frac{K_2{}^* M_A}{C_A} \tag{5}$$

2.2 Data Description

This section of the research work entails source of data, choice of dataset, data analysis tool

2.2.1 Source of Data

Data are sought from Federal University Wukari, using simple sampling techniques and well-structured questionnaire for accessing staff respondent. This is a situation whereby a certain sample of the Federal University Wukari members was randomly made to represent the entire population of the university community in the research. However, during the study, only the set of persons that were mentally, socially and emotionally affected and the likes were not considered. Natural situation(s) such as are stated above may affect the authenticity of our research model and may not allow the model result to conform to reality. Also, the data collected were appropriate as they were directly from the research field within the Federal University Wukari, after all possible and positive screening, 20 data were finally considered for the research.

2.2.2 Choice of Dataset

The dataset is highly affected by major factors which support their numbers for the analysis of the research work. The factors include but not limited to the following, working hours, competency of aged people, health, retiring time, mental effect, previous result of their work, working age and working timely effect and the analysis tool for data evaluation.

However, after evaluation of the dataset prior to the total number of retirees per season in every other sector and institution (governmental offices, ministries, academic settings, arm force) to be minimal (mostly 30%), and mental age prompt the choice of dataset to meet the best line of fit as it conform to reality.

2.2.3 Data Analysis Tool

The cumbersomeness of data and accuracy of model can't be handled numerically or other means, we adopt the least square method in evaluating the set of data as the analysing tool the model. The least square is a modelling tool aimed at producing result for unknown constants along with the highest value of model equations.

2.2.4 Analysing and Modelling

To evaluate the constants in the model equation above, our equation (5) is going to be differentiated partially with respect to the constants.

Hence, minimize the model using least squares method as follows:

$$Y_{min} = Min \sum \left(I_Q - \frac{K_1{}^*}{C_A} - \frac{K_2{}^* M_A}{C_A} \right)^2 \tag{6}$$

Differentiating with respect to the constants ($K_1{}^*, K_2{}^*$) yields the following

$$\frac{\partial Y}{\partial K_1{}^*} = -2 \sum_{i=1}^{20} \left(I_Q - \frac{K_1}{C_A} - \frac{K_2 M_A}{C_A} \right) * \frac{1}{C_A} = 0 (at\ turning\ point) \tag{7}$$

$$\frac{\partial Y}{\partial K_2{}^*} = -2 \sum_{i=1}^{20} \left(I_Q - \frac{K_1}{C_A} - \frac{K_2 M_A}{C_A} \right) * \frac{M_A}{C_A} = 0 (at\ turning\ point) \tag{8}$$

From equation (7) we have

$$\sum_{i=1}^{20} (I_Q)_i * \left(\frac{1}{C_A} \right)_i = K_1{}^* \sum_{i=1}^{20} \left(\frac{1}{C_A} \right)_i^2 + K_2{}^* \sum_{i=1}^{20} \frac{(M_A)_i}{(C_A)_i^2} \tag{9}$$

Similarly from equation (8), we have

$$\sum_{i=1}^{20} (I_Q)_i * \left(\frac{M_A}{C_A} \right)_i = K_1{}^* \sum_{i=1}^{20} \frac{M_A}{(C_A)_i^2} + K_2{}^* \sum_{i=1}^{20} \left(\frac{M_A}{C_A} \right)_i^2 \tag{10}$$

2.2.5 Research Instrument used

The research instrument used is known as random sampling technique. This is a situation where a certain sample of the Federal University Wukari members was randomly made to represent the entire population of the university

community in the research. Also, the data collected were appropriate as they were directly from the research field within the federal university wukari, After all possible and positive screening of the data, 20 data were finally considered for the research as shown below:

Table 1.

C_A	I_Q	M_A	I_Q/C_A	$(C_A)^2$	$1/(C_A)^2$	M_A/C_A	$(M_A/C_A)^2$	$M_A/(C_A)^2$	$I_Q(M_A/C_A)$	1/CA
65	60	12	0.92307692	4225	0.000236686	0.184615	0.034083	0.00284	11.0769231	0.015385
68	39.13	9	0.57544118	4624	0.000216263	0.132353	0.017517	0.001946	5.17897059	0.014706
65	50	10	0.76923077	4225	0.000236686	0.153846	0.023669	0.002367	7.69230769	0.015385
69	16.67	4	0.2415942	4761	0.00021004	0.057971	0.003361	0.00084	0.96637681	0.014493
66	38.1	8	0.57727273	4356	0.000229568	0.121212	0.014692	0.001837	4.61818182	0.015152
68	47.83	11	0.70338235	4624	0.000216263	0.161765	0.026168	0.002379	7.73720588	0.014706
66	42.86	9	0.64939394	4356	0.000229568	0.136364	0.018595	0.002066	5.84454545	0.015152
70	16	4	0.22857143	4900	0.000204082	0.057143	0.003265	0.000816	0.91428571	0.014286
68	30.43	7	0.4475	4624	0.000216263	0.102941	0.010597	0.001514	3.1325	0.014706
65	25	5	0.38461538	4225	0.000236686	0.076923	0.005917	0.001183	1.92307692	0.015385
67	13.64	3	0.20358209	4489	0.000222767	0.044776	0.002005	0.000668	0.61074627	0.014925
66	9.52	2	0.14424242	4356	0.000229568	0.030303	0.000918	0.000459	0.28848485	0.015152
71	23.08	6	0.32507042	5041	0.000198373	0.084507	0.007141	0.00119	1.95042254	0.014085
68	30.43	7	0.4475	4624	0.000216263	0.102941	0.010597	0.001514	3.1325	0.014706
70	32	8	0.45714286	4900	0.000204082	0.114286	0.013061	0.001633	3.65714286	0.014286
72	29.63	8	0.41152778	5184	0.000192901	0.111111	0.012346	0.001543	3.29222222	0.013889
67	40.91	9	0.61059701	4489	0.000222767	0.134328	0.018044	0.002005	5.49537313	0.014925
68	43.48	10	0.63941176	4624	0.000216263	0.147059	0.021626	0.002163	6.39411765	0.014706
66	52.28	11	0.79212121	4356	0.000229568	0.166667	0.027778	0.002525	8.71333333	0.015152
68	30.43	7	0.4475	4624	0.000216263	0.102941	0.010597	0.001514	3.1325	0.014706
1353	**671.4**	**150**	**9.97877447**	**91607**	**0.004380922**	**2.224052**	**0.281977**	**0.033003**	**85.7512168**	**0.295884**

Using the data collected form equations as evaluated in table1, we have

$$\sum_{i=1}^{20} \frac{I_Q}{C_A} = 9.97877447, \sum_{i=1}^{20} \frac{1}{(C_A)^2} = 0.004380922, \sum_{i=1}^{20} \left(\frac{M_A}{C_A}\right)^2 = 0.281977$$
$$\sum_{i=1}^{20} M_A/(C_A)^2 = 0.033003, \sum_{i=1}^{20} I_Q(M_A/C_A) = 85.7512168$$

By substituting our values above into equation (9) and (10) gives,

$$9.97877447 = 0.004380922K_1^* + 0.033003K_2^* \quad (11)$$

$$85.7512168 = 0.033003K_1^* + 0.281977K_2^* \quad (12)$$

Solving the system simultaneously by computational method in order to obtain (K_1^* and K_2^*)

$$K_1^* = -111.2947030$$
$$K_2^* = -317.1332268$$

Substituting the values of K_1^* and K_2^*into equation (5)

$$\therefore I_Q = -\frac{111.2947030}{C_A} + 317.1332268 * \left(\frac{M_A}{C_A}\right) \quad (13)$$

Hence the model's result.

3. Results and Discussion

In this chapter, we shall be considering the following:

- Optimization of the Model
- Validation of our Model

3.1 Optimization of the Model

This approach is a technique for programming/optimizing an objective function or a model in order to know whether a model confirms to reality or not. However, in the concluding part of the previous chapter, data were collected in order to be able to evaluate our emerging model equation constants. Hence we optimize our result by Lagrange's

multiplier method subject to a particular constrain. But, the first part of our optimization process shall be the determination of the model's critical value as below:

Determination of the critical points model

From the section above, our model obtained as shown in equation (5) is:

$$I_Q = \frac{(K_1+K_2M_A)}{C_A} \tag{14}$$

$$\Longrightarrow I_Q = (K_1 + K_2M_A){C_A}^{-1} \tag{15}$$

Hence, following the optimisation approach of the work of researchers [23], the first and second partial differential of equation (14) is as follows;

$$\begin{gathered}\frac{\partial I_Q}{\partial M_A} = \frac{K_2}{C_A} \\ \frac{\partial^2 I_Q}{\partial {M_A}^2} = 0 \\ \frac{\partial I_Q}{\partial C_A} = -\frac{K_1+K_2M_A}{(C_A)^2} \\ \frac{\partial^2 I_Q}{\partial {C_A}^2} = 2\frac{(K_1+K_2M_A)}{(C_A)^3} \\ \frac{\partial^2 I_Q}{\partial M_A\,\partial C_A} = \frac{\partial}{\partial M_A}\left(\frac{\partial I_Q}{\partial C_A}\right) \\ \frac{\partial^2 I_Q}{\partial M_A\,\partial C_A} = -\frac{\partial}{\partial M_A}\left(\frac{K_1+K_2M_A}{{C_A}^2}\right) = -\frac{K_2}{{C_A}^2}\end{gathered} \tag{16}$$

$$Let\ A = \frac{\partial^2 I_Q}{\partial {M_A}^2}, B = \frac{\partial^2 I_Q}{\partial M_A\,\partial C_A}, and\ C = \frac{\partial^2 I_Q}{\partial {C_A}^2} \tag{17}$$

But according to a lemma in Algebra,

1. If $B^2 - AC > 0$ or AB < C^2 than f(x, y) has no extreme value that is, if has a saddle point at (x_0, y_0).

2. If $B^2 - AC = 0$, then no information is derivable about the model's extreme values.

3. If $B^2 - AC < 0$, it implies that f(x, y) has extreme value (x_0, y_0) and minimum if A>0, and it is maximum if A<0.

Hence imputing the value of equation (17) from our model,

$$\begin{gathered}B^2 = \left(\frac{K_2}{{C_A}^2}\right)^2, C = 2\frac{(K_1+K_2M_A)}{{C_A}^3}, and\ A = 0 \\ \Longrightarrow B - AC = \frac{{K_2}^2}{{C_A}^3} > 0 \\ That\ is\ B^2 - AC = \frac{(317.1332268)^2}{{C_A}^3} > 0\end{gathered} \tag{18}$$

Therefore, from cognitive deduction form equation (18),

$$\therefore B^2 - AC > 0 \tag{19}$$

Hence, our optimal value for human IQ is a saddle point since equation (19) is greater than zero.

This means that there is neither a maximum or minimum IQ in life. The only snag here is that those people whose IQ is extremely low need urgent attention from charity organization, NGO and even government agencies if we do not want to multiply the rate of wrong decision made by aged people above 65 years in Nigeria since their decision can easily affect and trigger actions among the younger once but to find a way of resolving the existing problems that can be committed by them.

3.2 Model validation and Result

After the model had become ready for use, the researcher conducted a pilot test using some people living in Federal university Wukari (the area of the research) to see whether or not the absolute difference between the model data generated and actual measurement done for the people have an approximate figure. This little difference in

measurement however, is due to the fact that, the parameters considered by the researcher are not the whole parameter associated with the study of an IQ.

Hence, this confirms the views that, the model parameter relationship are inexact. In the same vein the model is developed and validated in Nigeria (Federal University Wukari, Taraba State). If considered logical could be used to make a universal generalizations about IQ of any other above 65years person in the world. However, the table below gives a validation of the questionnaire data to see whether the model really measures what it claims to measure in order to be able to conclude if the modal confirms to reality or not.

Tabular Validation of the model;

$$\therefore I_Q = 317.1332268\left(\frac{M_A}{C_A}\right) - \frac{111.2947030}{C_A}$$

Table 2.

Questionnaire data	Calculated model data	Absolute difference/error
60	56.83545	3.16455356
39.13	40.33683	1.2068285
50	47.0775	2.922499
16.67	16.77157	0.10156818
38.1	36.75411	1.34589225
47.83	49.66428	1.83427635
42.86	41.55916	1.30084336
16	16.53197	0.53197435
30.43	31.00938	0.57938066
25	22.68264	2.3173626
13.64	12.53888	1.10111974
9.52	7.923814	1.5961856
23.08	25.23246	2.15245997
30.43	31.00938	0.57938066
32	34.65387	2.65387302
29.63	33.69127	4.06126544
40.91	40.93887	0.02887072
43.48	45.00055	1.52055243
52.28	51.16925	1.11074558
30.43	31.00938	0.57938066
671.4		**30.6890126**

It is observed from the table 2 that our gathered data on human IQ is approximately coincided with the model result (calculated data is approximate to gathered data), and generate a negligible model difference.

Correlation between Questionnaire Data and Model Prediction of IQ

Table 3.

I_Q	$I_{Q\ MODEL}$	$I_Q * I_{QMODEL}$	$\left(I_{QMODEL}\right)^2$	$(I_Q)^2$
60	56.83545	3410.126786	3230.267972	3600
39.13	40.33683	1578.380099	1627.059734	1531.157
50	47.0775	2353.87505	2216.2911	2500
16.67	16.77157	279.5820415	281.2854991	277.8889
38.1	36.75411	1400.331505	1350.864436	1451.61
47.83	49.66428	2375.442338	2466.540345	2287.709
42.86	41.55916	1781.225454	1727.163501	1836.98
16	16.53197	264.5115895	273.3061758	256
30.43	31.00938	943.6154534	961.5816887	925.9849
25	22.68264	567.065935	514.5020394	625
13.64	12.53888	171.0303267	157.2235182	186.0496
9.52	7.923814	75.43471312	62.78683469	90.6304
23.08	25.23246	582.3651761	636.6770361	532.6864
30.43	31.00938	943.6154534	961.5816887	925.9849
32	34.65387	1108.923937	1200.890915	1024
29.63	33.69127	998.2721949	1135.101367	877.9369
40.91	40.93887	1674.809201	1675.991136	1673.628
43.48	45.00055	1956.62402	2025.049719	1890.51
52.28	51.16925	2675.128621	2618.292598	2733.198
30.43	31.00938	943.6154534	961.5816887	925.9849

$\sum_{i=1}^{20} I_Q = 671.4$	$\sum_{i=1}^{20} I_{QMODEL}$ $= 672.3906$	$\sum_{i=1}^{20} I_Q * I_{QMODEL}$ $= 26083.97535$	$\sum_{i=1}^{20} (I_{QMODEL})^2$ $= 26084.3899$	$\sum_{i=1}^{20} (I_Q)^2$ $= 26152.94$

$$Correlation\ coeddicient\ (r) = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left[n\sum x^2 - (\sum x)^2\right]\left[n\sum y^2 - (\sum y)^2\right]}} \tag{20}$$

$$r = \frac{20*26083.97535 - 671.4*672.3906}{\sqrt{[20*26152.94 - 671.4^2][20*26084.3899 - 672.3906^2]}} \tag{21}$$

$$r = 0.990405 \tag{22}$$

Remark: the outcome of the correlation coefficient analysis carried out using the value in the table 3 shows that r= 0.990405. Therefore we assert that our model is approximately 99% in agreement with real life data used. We therefore recommend the model as a standard model for predicting the rate IQ for human above 65 years.

NOTE: Adult IQ model may not be suitable for children and teens. This is because the interpretation of their IQ depends upon mental age and the chorological age.

3.3 Comparing Model with IQ Model of Teenage

The generally accepted teenage model to evaluate the learning capacity of young people gives a great difference when used to compute similar dataset of the aged persons. This could result from the parameters used in the IQ Model for the Aged persons.

Thus the general model given as;

$$IQ = \frac{M_A}{C_A} * 100$$

The computation from the above Model is shown below;

Table 4.

Sign	C_A	I_Q	M_A	calculated IQ	Difference
1	65	60	12	18.46154	41.538462
2	68	39.13	9	13.23529	25.894706
3	65	50	10	15.38462	34.615385
4	69	16.67	4	5.797101	10.872899
5	66	38.1	8	12.12121	25.978788
6	68	47.83	11	16.17647	31.653529
7	66	42.86	9	13.63636	29.223636
8	70	16	4	5.714286	10.285714
9	68	30.43	7	10.29412	20.135882
10	65	25	5	7.692308	17.307692
11	67	13.64	3	4.477612	9.1623881
12	66	9.52	2	3.030303	6.489697
13	71	23.08	6	8.450704	14.629296
14	68	30.43	7	10.29412	20.135882
15	70	32	8	11.42857	20.571429
16	72	29.63	8	11.11111	18.518889
17	67	40.91	9	13.43284	27.477164
18	68	43.48	10	14.70588	28.774118
19	66	52.28	11	16.66667	35.613333
20	68	30.43	7	10.29412	20.135882
	1353	**671.4**	**150**		**449.01477**

The absolute difference of the general IQ Model $IQ = \frac{M_A}{C_A} * 100$ is 449. 01477, which shows that there is no best line of fit due to necessary parameters that are not present. Also, the margin between IQ of dataset and IQ Model is very wide. Hence the model does not really conform to reality as the formulated model.

The formulated model $I_Q = 317.1332268\left(\frac{M_A}{C_A}\right) - \frac{111.2947030}{C_A}$ with absolute difference of 30.6890126. That implies that the IQ of dataset is approximate to the calculated IQ, and then conformation of model to real data is possible.

4. Conclusion

From our equation (19) above, where our optimization result is a saddle point which means that there is neither a maximum nor minimum IQ in life. The only snag indicated by this research work is that, those people whose IQ is extremely low need urgent attention from charity organizations, NGO and even government agencies. It then also shows that the services of the aged persons above 65 years cannot be ignored, it only require a little effort or input from governmental agencies or relevant organisation to improve their IQ. Hence their services can be required in area like consultancy service, contract lecturers and sensitive security intelligence area when orientation and workshops or training is organised prior to certain field.

4.1 Numerical Result

The formulated model, $I_Q = 317.1332268\left(\frac{M_A}{C_A}\right) - \frac{111.2947030}{C_A}$, with the gathered data shows that the margin created in retirees IQ is highly negligible and little attention is needed to sharpened and to gain their contribution to the society. The absolute difference between gathered data and calculated data (30.6890126), also reflects the accuracy of the model as it conforms to reality.

4.2 Limitation of the Proposed Model

The model has the limitations in view;

- The data only measure a single set of data of retirees amidst other discipline.
- It only covers working hours of the institutions and formal terminal leave, break and study leave are not considered
- The model does not capture other human factors as its parameter such as emotional intelligence, environmental factor, and social factor
-

4.3 Prospects for Future Research

- Future research work would entail all parameters that would likely affect IQ.
- Further research work will then cover all ages and how most activities of different age affects the IQ of preceding age group, also feedback from the society.

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