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Influence of Age-group in Public trust in science and scientific research

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Abstract

The aim of this study is to find the relationship between the age group of public and their level of trust in science and scientific research. Here public trust in science and scientific research is considered as the dependant variable while the age group of public is considered as the independent variable of this study. A five point Likert-scaled questionnaire was created and directed among the selected residents of the Manmunai North division of Batticaloa district. The findings of this research points out that the age group of public is significantly related to their level of trust I science and also has revealed that the age group holding a higher level of trust in science is astonishingly the middle aged adult group of an age range of 35-55. These outcomes are allied to guide the nation's overview regarding the trust of general public in science and scientific research which will have a prominent impact in the development of the nation.

Key words: Age, public trust, trust in science.

1. Introduction

1.1 Background ofthe study

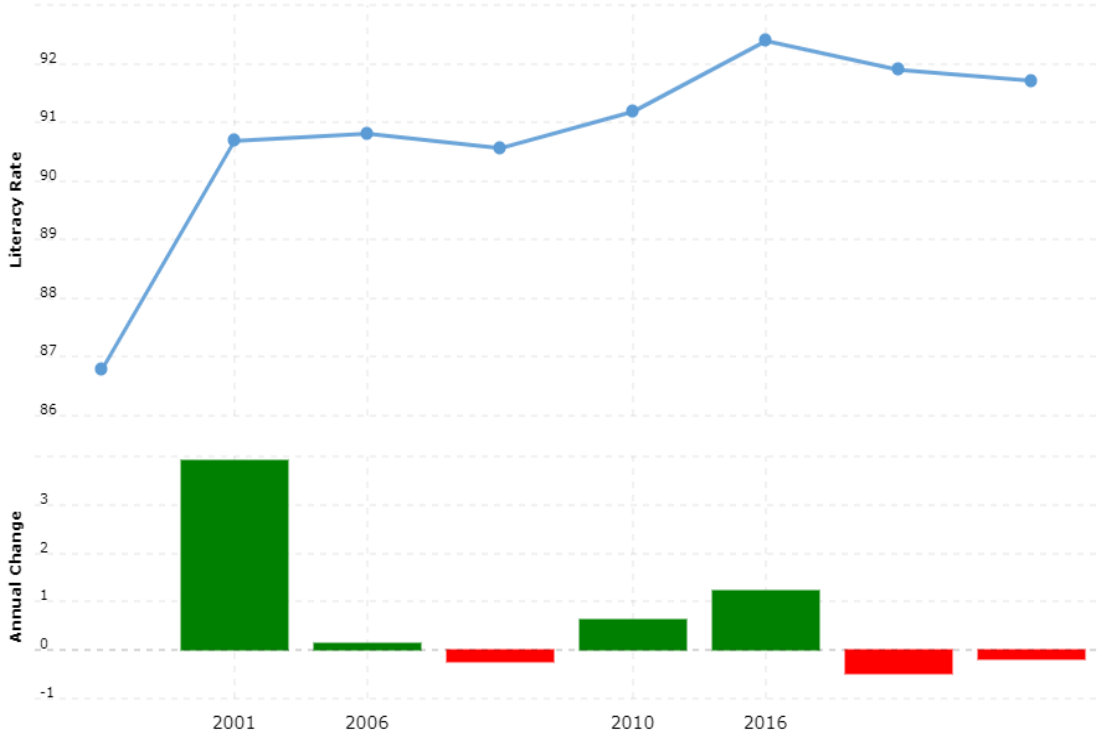
In this progressively scientific and technological era, our need to adapt to the scientific path and lifestyle which we've to follow has been ever increasing. Visualizing on a grander scale, various institutions, organizations and government agencies find it crucial to initiate and progress various existing and new projects based on scientific perspectives. Thus, building a reliable scientific framework for any developmental, essential or even a very basic process nowadays completely depends on scientific research, which is capable of ensuring the preciseness and sustainability of the projects developed in such manner.

The outcomes of most of the developmental projects based on scientific research lean towards enhancement of public lifestyle and the nation's economy- which is also an indirect link to the public. Public contribution for these scientific researches in forms of understanding or support or even complaint is quite rare most of the countries. Since

contribution follows trust, lack of public trust in science leads to lack of trust in scientific research, scientists and scientific projects thereby leading to lack of contribution.

Globally, 18% of the world population have a high trust in scientists and scientific research, while 54% have medium trust, and 14% of the people have low trust. The rest of the population which is 13% of the total, have no opinion about their trust in scientists and scientific researches of their respective countries.People of developing countries and low income countries tend to have higher percentage of people who have 'low' trust in scientists, compared to high income countries.

Sri Lanka as a country with a current literacy rate of 91.71% and being identified by the United Nations as one of the only two countries in South Asia that shows 'high human development', achieved this feat by shaping the development of Sri Lankan education(Macrotrends 2020). In accordance to the facts from the Ministry of Education, our country has underwent 'comprehensive educational Reforms' in 1947, 1960-1961, 1972, 1981, 1997 and 2006 which include; introduction of free education from kindergarten to university, acquiring of private schools by the government, decentralization of educational administration , establishment of National institutes and Colleges. According to the literary trend of Sri Lanka, we can observe a considerable improvement comparing to that in 1981 during the first census.



This obviously explains gradual development of the literacy and educational status of the general public and also builds a firm ground to state that the extent or the ease of educational access by public has been ever increasing since the past. This can be in other words, also viewed as that; generally the ease of educational access for the citizen had been harder travelling back in time- which leads to a conclusion that in Sri Lanka, from the past few decades, educational level of Sri Lankan citizens has been on par with their age.

Though several studies have probed the influence of various other factors affecting scientific trust of public, age which hasn't been analysed deeply so far can be considered to be an easily observable demographic factor which affects scientific trust, particularly in developing countries.

1.2 Researchproblem

Sri Lanka being enlisted among the developing countries of the world, is undergoing consistent progresses in urban and rural development projects. The present scientific era presents us the necessity of sticking to scientific researches to accomplish these development

goals. Since the goals are executed out for the people of the nation, their understanding, contribution and support for such scientific projects and researches are certainly necessary not only to promote projects but also to speak out any possible adverse issue that they might face in a negative case. This can be explicable as follows, public opinions and attitudes in building a coal power plant, construction of chemical industries in their locality, constructing 5G internet towers, consuming genetically modified organisms and food derived from them and public attitude about global climatic changes and their understanding about their roles in this serious environmental issue.

Lack of public understanding and contribution in scientific research and projects is an unspoken issue that exists obviously and is also an issue which can solely be traced back to the lack of scientific trust of the public. Public trust in science directly influences public understanding of the vulnerability of a scientific issue presented to them and is therefore is a key factor influencing their contribution to scientific research. Some critical issues are as follows.

Global warming due to enhanced greenhouse effect is a serious ecological issue being faced currently. The livestock sector is responsible for about 14.5% of total Human- induced greenhouse gas emissions which is around7.1 gigatonnes CO2-eq. per annum according to FAO's Global Livestock Environmental Assessment Model (Gerber et al., 2013). Methane gas which is mostly produced by fermentation in the guts of ruminants and manure storage, effects on global warming 28 times higher than that of CO2. Furthermore, Nitrous oxide from usage of fertilizers and manure storage, has a global warming potential 265 times higher than CO2.But the public awareness and understanding of this issue seems to be very low. Even if we focus in Sri Lanka, most of the bottled water industries use water from dug wells, tube wells, and springs across Sri Lanka as water source (Piyarathne 2020). Many springs found in our locally are active throughout the year to supply a sufficient amount of water for industrial and domestic uses (Piyarathne 2020). But the springs often can't upkeep the extent of water being drawn out, and at times will even totally dry up (Augsburg University 2018).C:\Users\mac\Downloads\This chapter provides an overview of the current state of knowledge concerning global warming with special reference to contribution from livestock resources.docx

Analysing public on their scientific belief, different age groups tend to show differed results. In the situation of a scientific and developmental project commencement, when the opinion of residents of the neighbouring area of the project site is to be considered and evaluated, more value would certainly be allocated for the views of middle aged citizen and much older adults who are either employees or pensioners. But due to their lack of trust in science, this significant age group nulls in involvement.

The key goal of this article is to assess the relationship between age-group of public and the public trust in scientific research and scientific projects as different age groups have different statutory value in projects and policies and also are the key parameters in developmental projects based on scientific research.

1.3 Research question

1. What is the relationship between the age group of the public and their respective trust in science and scientific research?

2. Which Age Group impacts more in the public trust in science and scientific research?

1.4 Objective of thestudy

The specific objective of this study is stated below. These objectives have been resulted from the research question and the purpose of the study.

1. To identify the relationship between public age group and their trust in science and scientific research.

2. To identify the age group that highly affects Public trust in science and scientific research

2. Literature review

Several codes of professional behaviour, reports from government agencies and scientific organizations, scholarly articles, editorials, monographs, and textbooks cite the need to promote public trust in science as a reason for developing or revising ethical standards, ensuring compliance with law, overseeing research activities, educating public about science, and teaching students and trainees about responsible conduct in research. Why do we need to

analyse public trust in science to a greater extent? It is all because of a single fact that 'Clarity is virtue'. Absence of clarity can lead to discrepancy in thought and action (Rosenberg 1995). If people have misinterpretations about science and scientific research, that may lead them to refute their contribution in scientific researches and for the worst, may also make them misguidedly support incongruous policies or recommendations.

2.1 Trust

Trust is a multifaceted concept which includes affective and cognitive perspectives (Louis and Kimberly 2015). Trust can be relied upon to support commitment to an idea, or in case of lack of trust, disapproval of an idea (Omer et al. 2009). Trust can be increasingly influential on perceptions of emotionally fuelled scientific issues such as climate changes (Dunlap and McCright 2011), vaccine (Keelan et. al 2010), food derivate from genetically modified

Speaking of the fundamental perceptions about trust; first of all trust is a bond between or among people, between individuals and groups and among groups which may be explicit or implicit, concrete or abstract. Trust is different from faith because it is usually based on some proof of reliability while faith relies on pure belief without evidence. The use of the word trust in trusting things (i.e. money, readings of meters) is derived, because trust applies mainly to human relationships. Trust is capable to generate moral and legal duties (David 2011).

The main goal of trust is to facilitate cooperative social interactions.Trust is essential to promote cooperative relationships and activities among researchers. It is also vital with human subjects where developing trust between investors and human subjects is essential for enrolling and retaining research participants (Mastroianni 2008).

2.2 Public trust in science and scientific research

First ofall, the phrase 'public trust' can be illustrated as, "the trust that society places on scientific research" (David 2011) or "society trusts that scientific research results are an honest and accurate reflection of a researcher's work" (Committee on Science, Engineering and Public policy 2009).

People's trust in science is built on their confidence and expectation that science will improve their lives as healthier, longer, stronger, more interesting and therefore more pleasant than the existing(RathenauInstituut 2018).

Since scientific research plays a very important role in analysing issues regarding public health, environmental issues such as climate changes, power and energy utility, city planning, urban and economic development and many other major issues; public trust researchers to provide awareness and proficiency regarding those issues. Scientific research also gives significant yield in the sectors of medicine, engineering, communication, agriculture, technology etc. So public who trust science and scientific researches rely on scientists to make a data based precise judgement on these issues.

2.3 Age group influence

Five main age groups could be considered, namely- teenagers, youth, young adults, middle aged adults and older adults. There are no perfect guidelines to define the ages to be included in each age groups. According to Wikipedia, a teenager is a young person whose age falls between 13 to 19 years old. Hence the International Labour Organization declares 14 years old as the minimum age limit for child labour, teenagers in this study are consistent in the age group of 14-18.

Youth can be defined as 15-24 years of age (United Nations). However World Health Organization declares the age group of 10-24 as young people while in it, the age group 10-19 falls under adolescents and that of 15-24 fall under youth.Meanwhile, the U.S. Federal Interagency Forum on Child and Family Statistics of defines young adults as individuals aged 18-24. Psychologically speaking, a prominent psychologist Erik Erikson describes 19-39 as the young adult age group while on medical terms, young adulthood roughly falls between the ages of 15-29 when a person is traditionally the healthiest. For this study, the age range of 19-24 was considered as youth while the ages 25-34 are used to denote young adult age range.

The United Nations stating that people of ages greater than 60 as older or elderly persons, older adult age group is convenient to set as people aged older than 55 years old. And therefore, the middle aged adults are set as persons whose age range falls in 35-55 years old (Nancy 2002).

It is a globally observable and acceptable fact that children, teenagers and younger adults are the part of the public who have a higher level of trust in science and are inclining to extend their contribution to scientific research even at least having an understanding about what they are supporting or denying. 1.6 million Students in 300 cities marched on a single day in protest- sounding the alarm of climatic change in March, 2019. The march held in Washington D.C in the United States of America in 2020 to fight for science consisted a large percentage of young adults and teenagers. So it is obvious that younger generation are willing to trust science. But older generation who are the senior citizens of the country, thereby having a great statutory value in a nation's population don't have enough trust in science.

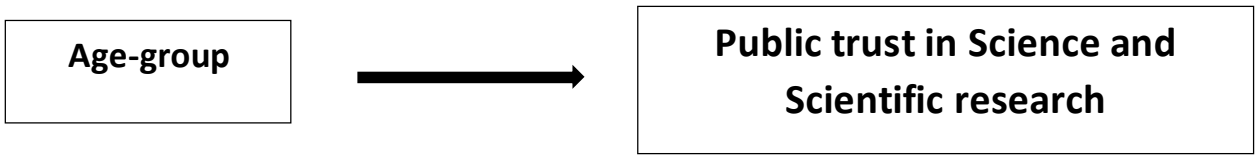
Looking more closely, older adults face a number of obstacles when adapting themselves to new technology and scientific facts. The most prominent obstacle is their dubious attitude about the benefits of science and technology and the next is their hardships in understanding science & technology and using new technologies (Neeta 2020).

It is a widely accepted fact that children, teenagers and younger adults have a higher level of trust in science compared to older adults even if there are exceptions .Younger age-groups are more likely than their elders to say that we humans have a huge role on climatic changes and global warming and also that, attention must be given in developing alternative energy sources over increasing the fossil fuel production (Pew Research Centre 2020). Young EU citizens of age range 15-25 were willing to support the idea that young people's interest in science is essential for future prosperity: half of the respondents agreed strongly and 39% inclined to agree.These youngsters chose 'citizens' when they were asked who must have the most influence on decisions about the division of research funds in their country (26%); no-one chose private enterprise (2%), while the EU was in the middle of these two options (13%).A majority of these young citizens (57%) also state that the best resolution for the greenhouse effect and global warming issues would be a major alteration in Europeans' way of living.

Younger adults are more likely than older adults to think that the evolution process had occurred and also that, scientists generally believe the 'Big Bang theory' of how the universe was created (Pew Research Centre 2020).

3. Conceptualization

The conceptual framework provided below was built based on the literature survey. This framework depicts the dependant and independent variables concerned.



4. Methodology

The aim of this study is to empirically inspect the assumption that the demographic factor-Age might have influence overpublic trust in Science and Scientific research in Batticaloa district.

4.1 Sample Selection

Residents from 'ManmunaiNorth division'located in the Batticaloa District were selected on simple random basis to collect information regarding the trust of public in science and scientific research. The data was collected by issuing questionnaires to 100 residents comprising 5 age groups: 14-18, 19-24, 25-34, 35-55, and above 55.

4.2 Data Collection Methods and Instruments

This study was conducted based on primary data. Structured questionnaires were used to collect data. The questionnaire consisted of statements on the chosen variable. Likert scale of 1-5 which ranges from "Strongly Disagree" to "Strongly Agree" was applied in the questionnaire to identify responses. Given the purpose of quantification of variable, Numerical values were provided as follows:

1. Strongly disagree
2. Disagree
3. Moderately agree
4. Agree
5. Strongly agree

4.3 Data Presentation, Analysis and Evaluation

Data has been presented using tables. For the meantime, descriptive analysis was used to analyse data. Therefore, under the descriptive analysis, the mean and standard deviation were derived from the complete analysis of 100 respondents. Independent sample t-Test was run to check whether or not the independent variable has influence over public trust in science and scientific research. For this purpose, Statistical package of SPSS 22.0 has been used.Moreover, the criteria shown in the table below were adopted to calculate mean values.

Table 1. Decision rule for univariate analysis

Range	Decision attributes
$1 \leq Xi \leq 2.5$	Low level
$2.5 < Xi \leq 3.5$	Moderate level
$3.5 < Xi \leq .5.0$	High level

Source- Formed for this research

4.4. Data Analysis

Univariate analysis was used in this study to evaluate the objective. In this study, the mean is used to measure the central tendency while the dispersion is described using the standard deviation. Under the univariate analysis, descriptive statistics was used. So for this analysis; mean values, and standard deviation of the variables were taken into consideration in order to find out the level of trust in science.

Variable	Mean	Decision Attributes	Standard Deviation
Trust	3.895	High Level	0.5994

Table 2: The Level of Trust

Range	Level	Frequency	Percentage
1.00 ≤ x□ ≤ 2.60	Very Low Level	00	0.0%
1.80 ≤ x□ ≤ 2.60	Low Level	7	7.0%
2.60 ≤ x□ ≤ 3.40	Moderate Level	9	9.0%
3.40 ≤ x□ ≤ 4.20	High Level	55	55.0%
4.20 ≤ x□ ≤ 5.00	Very High Level	29	29.0%
	Total	100	100%

Table 3: Descriptive Statistics for overall Frequency Level of Trust

According to the Table 3 which specifies the frequency level of trust. It is also noted that among respondents about 29.0% of respondents have very high level, 55.0% of respondents have high level, 7.0% of respondents have low level, 9% of respondents have moderate level, and 0.0% of respondents have very low level of contribution to identify the trust.

Pearson's Correlation Analysis

Table 4: Correlation Coefficient between Trust and Age

Variable		Purchase Intention
Trust	Pearson Correlation	.258**
	Sig. (2-tailed)	.010
**. Correlation is significant at the 0.01 level (2-tailed).		

Table 4 shows the results of Pearson correlation between trust and age. The correlation coefficient (r) value is 0.258 between trust and age at the 0.01 significance level (2-tailed) is 0.010. Moreover, the value is falls under the coefficient range of 0.1 to 0.29. Therefore, it can be concluded that there is a weak positive, and significant relationship between trust and age.

Simple Regression

In this model, age is the independent variable, and trust is the dependent variable.

Table 5: Model Summary of Trust and Age

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.258a	0.066	0.541	0.40077
a. Predictors: (Constant), age				

Simple Regression test was performed to examine the influence of trust and age. Based on Table 5 illustrates that 'R Square' statistic value is 0.066 which means 6.6% of the variation in Trust is explained by age.

Table 6: ANOVA for Trust and Age

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2.365	1	2.365	6.980	0.010b
	Residual	33.205	98	0.339		
	Total	35.569	99			
a. Dependent Variable: trust						
b. Predictors: (Constant), age						

According to Table 6, the proposed model was adequate as the F statistic (F = 6.980) were significant as the 5% level since the p-value is less than 0.05.

Table 7: Coefficients of Trust and Age

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.566	0.137		25.962	0.000
	Purchase intention	0.108	0.041	0.258	2.642	0.010
a. Dependent Variable: Actual purchase behaviour						

Based on below Table 7, regression equation can be written as follows:

$Y = \beta 0 + \beta 1X + e$

Where, Y – Trust

X – Age

APB = 3.566 + 0.108 X1

The results indicated that age (β = 0.108, p < 0.05) significantly influence the trust in science. Trust is equal to 3.566 when the age is zero.

Further the same table indicates p-value is 0.000 which is less than 0.05, indicates age is statistically significant at 5% predicts trust. Therefore, there is enough evidence to reject null hypothesis, and H1 of the study is accepted.

4.5. Data Evaluation

ANOVA					
Trust					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.254	4	1.063	3.226	.016
Within Groups	31.315	95	.330		
Total	35.569	99			

Table 8: Post-Hoc Analysis of Variance for Public trust and Age

According to Table 8, the proposed model was adequate as the F statistic (F = 3.226) were significant as the 5% level since the p-value is less than 0.05. Therefore H1 is accepted and trust in science significantly influenced by age.

For further justification post-hoc analysis was conducted. As per that homogeneous subsets table has indicatedthe significance level as 0.057 which is greater than significance level value of 0.05. Thus, it concludes that there is an equal variance. According to the multiple comparison scheffe test conducted, 35-55 age group people (mean 4.15, sig 0.049) had a high level trust in science in comparison with the people of other age groups.

5.Discussion

Though public trust in science and scientific research is dependent on many other variables such as religion, social status and educational level; we are all unaware of a study that has evaluated the trust of public in science and scientific research in relation to age. Hence, this

research addresses this literature gap also revealing the fact that the demographic factor age influences in the public trust in science and scientific research.

The positive correlation between age group and the trust of public in science and scientific research in Sri Lanka is an evidence which will elevate the predictability of increment of public trust in science and scientific research in the age groups that are concerned.

6. Implications

The implication of this study is that it proves that the trust of public on science and scientific research tends to rely on the age groups of the general public in developing countries like Sri Lanka. Though increasing the level of trust of public on science and scientific research all at once might be a substantial challenge, increasing the trust of students will be more practical and useful since they'll eventually be passed on the social responsibility and regards to make decisions in the not too distant future.

7. Limitations

The type of our sample is a limitation as it was from a single geographical area. The inhabitants of the considered region also revealed to consist of a variety of social backgrounds, educational levels which had been assumed to be dependable of the general inhabitant population of that area. Still, if respondents in the sample used are to beconsidered as a unified body, responsesand perspectives might differ slightly when comparing to samples from various other areas.

Another limitation is the multi-co-linearity of public trust in science, personal and parental religious commitment, and even political alignment. Although this study only focuses on one dependant and independent variable, this limitation indicates the possibility of other relationships that weren't able to be disclosed under this study.

So taking these limitations into consideration might render a greater understanding of public trust in science and scientific research in a developing country like Sri Lanka.

8. Conclusion

From this study, the aim of finding the relationship and its extent between the public age-group and their trust in science and scientific research was achieved successfully.

It is also evident in this research from the considered sample middle aged adults have higher level of trust unlike in other existing researches which mostly tend to argue that those with higher level of trust are the younger age groups. Public trust in science and scientific research poses a considerably significant impact in the development of developing countries like Sri Lanka. So catering the issues of public trust might be the basis to increase the rate of development, overall scientific advancement and prosperity of developing countries.

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