

Measuring user trust on intelligent assistants with respect to age

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Abstract—Technological advancements make people to lead their life easier by reducing their work loads. One of the important products of IoT is Intelligent assistant, who is growing its popularity day by day. As the technological developers fastened their process of giving updates every single day, it might be hard for some people to follow up and change themselves accordingly. We can only trust a technology if we completely understand how it is used to make our lives easier and how efficiently it works. This trust can be varied with lot of factors and age is one among them. In this paper, I tried to show how trust towards IAs (Intelligent assistant) can be varied with respect to age. An online survey is conducted with people from all age groups to know how much they trust their Intelligent personal assistants, with the results, I developed a correlation between age and trust and concluded the relationship between them.

Index Terms—Intelligent assistant (IA), trust, age, personal assistant.

I. INTRODUCTION

As a component of IoT (Internet of Things), IAs provides users with information utilizing artificial intelligence, machine learning, and natural language processing techniques. IAs facilitate information retrieval by providing information based on user input (e.g., offering weather updates) and acting on behalf of users to complete tasks (e.g., turning on/off lights at home) [6]. The number of users of IAs has increased from 3.25 billion to 4.2 billion in the time period of 2019 to 2020 and is expecting to cross 6.5 billion by 2024 by saista statistical analysis website. The growing popularity of IA systems in consumer sector can be diversified as attributes in one hand and the high availability on the other hand [3]. Irrespective of age most people be able to reduce their workloads through IA [2]. With the emergence of AI-powered assistants, such as Amazon's Alexa and Google's Assistant, many consumers are now able to control various devices and drive themselves. They can also save fuel by giving them information about when to start freewheeling [4]. Researchers already begun their investigation on use of IA by people with physical, sensory and cognitive disabilities. Findings that voice interaction seen as particularly valuable to users and individuals with mobility and visual impairments [8] [9].

II. TRUST

According to various journals, trust is defined in many possible ways. The word trust is defined as “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” by Rousseau et al.(1998). Another widely spread definition to trust is by Mayer et al.(1995) as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the person who trusts, irrespective of the ability to monitor or control that other part”. However, trust can be seen as the most important thing such as a key to unlock the word of acceptance of new technology to come into the daily lives. Researchers also showed that intentions to use the technology and adopting it are also based on the trust. [1]

III. RELATED WORK

A. Research IA's trust with respect to age

Voice assistants is one of the use cases of intelligent assistants which gained popularity these days with technological advancements like smart home and personal assistants, which became more common. Voice assistants are developed to serve many purposes, from shopping to payment and many others. IAs are being used by various age groups from younger to older generations. By the research works of various people, Intelligent assistants influence people in performance of tasks, using services and interacting with organizations, thus IAs have potential in fulfilling economic and social needs. Population ageing is a significant social transformation, with implications for nearly all sectors of society [10]. However, the latest technological advancements are getting developed by keeping younger generations in mind. This implies, “the world is designed against the elderly” [7]. Through observations made by many scholars, most computerized technologies are designed by and for young generations, without considering older population. Even in this kind of course events, Trends of rising adoption rates and usage of smart technology by older adults are also getting increased. Approximately 22% of

adults, over the age of 55%, own IA's like Amazon Echo, and this age group constitutes 33 of "first adopters" (i.e., individuals who adopt the technology within the first year of initial release). The data suggest that many adults, 55 years and older, perceive these devices as potentially useful [5]. Even though older adults are evolving and getting better in the use of modern devices, many literature still associate with the study of behaviors of older people about their moderate, fearful, and less equal with the understanding and use of the new technologies than younger generations. For example, computers, laptops, internet and mobile phones [10]. Lining with the outlook of trust barrier with the change in age, this article focuses on the correlation between age and trust and also how trust changes with respect to age [10].

IV. METHODOLOGY

An online survey was conducted with all the questionnaire related to conclude the relationship between an individual and their intelligent personal assistant. The survey with the questionnaire is send to all age groups irrespective of gender, qualification and location. Participants are asked to rate their IAs on the Likert scale, which differ from strongly agree to strongly disagree as shown in fig.1. Questions are formulated for asking participants about how well IAs perform tasks, understands users, possess integrity and doesn't link to any company to observe the trust variable of the users. A Pearson correlation test and independent sample t test are conducted on the collected data from the survey. A Pearson correlation test is used to measure the strength of relation between two variables. In this paper we want to find the relation between both trust and age. Next, we need to find weather there is a change in trust level with increase or decrease in age by comparing means of two groups which is achieved by independent sample t test.

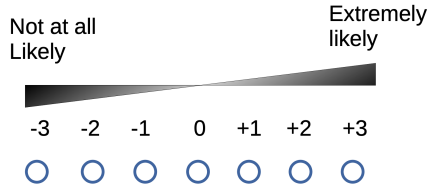


Fig. 1. Likert Scale

A. Data and Analysis

According to the survey results 160 responses are acquired where there are only 120 full responses to the questions related to all categories such as trust, dependency, behavior, experience etc. In 160 responses 75% responses were from male and 25% were from female users. 70% of the people completed their studies either in their bachelors or master's study. Therefore, we can clearly see most of the people participated in the study are educated. 60% of the people are employees and 26.25% are in their university study. In this study people ranging from age groups 21 to 73 are

participated, where most of the people belongs to the age groups of 21-30. As trust and age are the two important variables, all the responses belonged to trust are converted into a single variable with the median value of all 13 responses for each participant's age. All the 120 responses with both age and median trust values are divided into two groups with the median value of age by using median split method as shown in the descriptive table.

TABLE I
DESCRIPTIVE DATA

	AVERAGE	
	AGE GROUP- 1 (21-33)	AGE GROUP - 2 (33-73)
Valid	73	47
Mean	4.667	4.269
Variance	1.231	1.1846
Maximum	6.692	6.154

B. Identifying relation between trust and age (Pearson's classic correlation)

In order to identify most crucial aging base effect on trust, Pearson's classic correlation is proceeded on JASP. JASP is a software for analysing stastical data. Hereby, each age value is thought to be an independent variable affecting trust. Results are shown in Figure.2. According to the results $p < \alpha$ and it clearly states there is a relationship between both age and trust which is highly significant by cancelling the null hypothesis. Thus, there is a positive correlation between both age and trust.

Variable	AU08_01	AU08_02	AU08_03	AU08_04	AU08_05	AU08_06	AU08_07	AU08_08	AU08_09	AU08_10	AU08_11	AU08_12	AU08_13
1. AU08_01	Pearson's r	—											
	p-value	—											
2. AU08_02	Pearson's r	0.690	—										
	p-value	< .001	—										
3. AU08_03	Pearson's r	0.652	0.842	—									
	p-value	< .001	< .001	—									
4. AU08_04	Pearson's r	0.594	0.681	0.685	—								
	p-value	< .001	< .001	< .001	—								
5. AU08_05	Pearson's r	0.588	0.638	0.632	0.625	—							
	p-value	< .001	< .001	< .001	< .001	—							
6. AU08_06	Pearson's r	0.414	0.563	0.542	0.516	0.585	—						
	p-value	< .001	< .001	< .001	< .001	< .001	—						
7. AU08_07	Pearson's r	0.477	0.562	0.615	0.598	0.588	0.629	—					
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	—					
8. AU08_08	Pearson's r	0.453	0.558	0.622	0.565	0.418	0.522	0.671	—				
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	—				
9. AU08_09	Pearson's r	0.470	0.550	0.541	0.588	0.594	0.370	0.478	0.417	—			
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	—			
10. AU08_10	Pearson's r	0.215	0.310	0.320	0.218	0.309	0.310	0.290	0.292	0.389	—		
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	—	
11. AU08_11	Pearson's r	0.431	0.457	0.464	0.357	0.445	0.480	0.421	0.437	0.458	0.492	—	
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	—
12. AU08_12	Pearson's r	0.401	0.450	0.438	0.335	0.436	0.434	0.353	0.433	0.462	0.399	0.608	—
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001
13. AU08_13	Pearson's r	0.318	0.571	0.542	0.366	0.456	0.488	0.559	0.374	0.439	0.422	0.513	0.543
	p-value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001

Fig. 2. Pearson correlation results

C. Comparing means of trust in two age groups (Independent sample t-test(welch))

After defining relationship between age and trust, an independent sample t test is conducted on the age and trust for comparing means of two age groups. By taking null hypothesis as trust doesn't affect with increasing or decreasing in age and alternate hypothesis as trust decrease in increase in age. If this test able to cancel null hypothesis we can prove our alternate hypothesis is true. As there is an unequal variance as shown in table.1.I considered doing a welch t test. Taking age as my grouping variable and trust as my dependent variable, I got the mean values as shown in table.2 and doing a t- test (welch)

on JASP the results are shown in table.3. As we got the t test value as 1.692 and checking in the distribution table, we got a p value of 0.047, which is clearly less than 0.05. During a t-test whenever the $p < 0.05$ we consider the alternate hypothesis.

TABLE II
DESCRIPTIVE STATISTIC

	Group	N	Mean	SD	SE
trust	01	73	4.808	1.381	0.162
	02	47	4.319	1.643	0.240

TABLE III
INDEPEDNENT SAMPLE T-TEST RESULTS

Independent Samples T-Test

	t	df	p	Mean Difference
trust	1.692	85.987	0.047	0.489

Note. For all tests, the alternative hypothesis specifies that group 01 is greater than group 02 .

Note. Welch's t-test.

Where as N = sample size, SD = standard deviation, t = t-test value, p = probability

V. CONCLUSION & DISCUSSIONS

In this paper, the topic is, the measurement of trust factor with respect to age is dealt with. More specifically, if there is any relation between both trust and age. And aimed at, whether the trust decreases or increases with increase in age. In the analysis and testing of the survey results of 160 responses, only 120 full responses are considered. After correlation and t-test, the results are here by defined as there is a correlation between both age and trust and trust decreases with increase in age towards intelligent assistants. This work can be referred further in development and innovation of new ideas, most importantly in intelligent assistant systems. Considering the dimension of trust and valuing its usefulness helps increase in usage of the IA systems in the aging population. Further research ideas on this work provides insights on how to increase or improvise the usage on the base of trust in the older age groups.

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