AIDEA CONFERENCE, TRACK 2 - MANAGEMENT, ACCOUNTING E ORGANIZZAZIONE IN SANITÀ: OPPORTUNITÀ E MINACCE PRESENTI E FUTURE PER LA CREAZIONE DEL VALORE

TITLE: Is it all about trust? Elderly people's propensity to digital technology in healthcare: a case study from Italy

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ABSTRACT

Digital technologies for healthcare have found great development and diffusion in the pandemic period, especially as a solution to reach patients with chronic conditions, mostly elderly and residing in remote areas. However, in order to be effective, trust in these technologies is a central component of the interaction. Using data from a survey on the propensity to use digital technologies of elderly people residing in remote areas in four regions of Italy, the present study tests through of latent class model for polytomous outcome what is the probability that they trust health technology tools. The results show that the majority of the sample has trust in digital technologies, even if they do not use them directly. The factors influencing these probabilities turn out to be age and education level. This evidence may be considered useful in forming new digital health policies, especially in view of the factors that influence distrust of digital tools in healthcare.

1. INTRODUCTION

In recent years, especially with the advent of the pandemic, the use of digital systems for public and private service delivery has greatly increased (Amankwah-Amoah et al., 2021; Dunleavy et al., 2006). Indeed, the need to continue providing essential services and the obligation to maintain social distance has fostered the development of digital technologies, even in sectors that have rarely used them(Agostino et al., 2020; Barrutia & Echebarria, 2021; OECD, 2020). In addition, there is the potential to contain the costs associated with the provision of public services (European Central Bank, 2018; Peng & Tao, 2022; Wolff et al., 2020), which through the digital transition become more immediate and usable by the population.

Even in the health sector, the need to reach an increasing number of people in an emergency has encouraged the development of digital health and telemedicine tools (Baudier et al., 2021; Hashiguchi, 2020; Kato-Lin & Thelen, 2022; Solimini et al., 2021; Wilhite et al., 2022), especially for patients with chronic conditions (Currie et al., 2015; Wootton, 2012).

However, the question arises whether there is a willingness on the population side, or part of it, to use such technologies. Indeed, in addition to the traditional barriers associated with technology adoption, mostly related to skills and the digital divide (Cullen,

2001; Rogers, 2001; The Lancet Healthy Longevity, 2021), where difficulties are often observed in the elderly segment of the population (Smith, 2014; Van Den Berg et al., 2012; Yusif et al., 2016), especially in healthcare, it is crucial to examine whether, on the part of users, there is confidence in such new tools (Baudier et al., 2023).

In particular, the elderly (over 65 years of age) are the main recipients of investments in healthcare for chronic conditions (Bianchetti et al., 2020; Nouri et al., 2020; Sundgren et al., 2020), and are usually less accustomed to the use of technologies in general and so prospectively more doubtful (Gallistl et al., 2021; Saeed & Masters, 2021; Scott Kruse et al., 2018; Smith, 2014; Vainieri et al., 2023). Despite their lower digital literacy than younger generations, older adults have been more involved in the adoption of new health technologies, including the use of digital services to overcome the limitations imposed by the Covid-19 emergency. This trend is especially pronounced among those residing in remote areas, who already faced challenges accessing healthcare facilities before the pandemic(Philip et al., 2017).

For these reasons, this paper aims to analyze the trust in the use of technological tools in the elderly population residing in the remote areas of four Italian regions (Lombardy, Veneto, Tuscany, and Calabria), and to identify factors that can affect trust in these technological health tools. In Section 2 we present the theoretical background of our paper and in Section 3 the data used come from an original survey conducted through the SPI CGIL (for further details see Vainieri et al., 2023) and the statistical model. Section 4 shows the preliminary results of our analysis. Lastly, a brief discussion and conclusion are in Section 5.

2. THEORETICAL BACKGROUND

Trust is defined as a willingness to be vulnerable, based on the positive expectations and characteristics, of another party who will perform a specific action important to the first party (Baier, 1986; Jones, 2002; Mayer et al., 1995; Rousseau et al., 1998). Thus, in a broad sense, trust in technology refers to a willingness to depend on the specific technology in a given situation in which negative consequences are possible (McKnight et al., 2009). To be considered trusted, the technology possesses the necessary attributes to function as intended. These characteristics include adequate capacity and functionality, sufficient availability, and consistent reliability (McKnight et al., 2011). Furthermore, trust is considered to be an important determinant of users' acceptance and adoption of digital services (Mou et al., 2017). Indeed, it can be considered a predictor of intended use by the population (Gao & Waechter, 2017) as well as the primary construct for understanding users' perceptions of technology (Li et al., 2008). However, it is particularly difficult to quantify, as it is by nature not directly measurable. Indeed, even the use of specific questions or scales could be interpreted differently by users or still mask the actual response. For this reason, the concept of trust can be considered as a latent trait variable that is assumed to be related only to one or more manifest variables (Arminger & Küsters, 1989; Van Der Werff et al., 2019).

Factors that influence the introduction of innovations (Rogers, 1995) and, in particular, innovative technological tools have been examined several times in the literature (Kapoor et al., 2014; Love & Roper, 1999; Van de Ven, 2017), also with reference to the healthcare sector (Barlow, 2016; Barlow et al., 2006). Factors such as age, education level, income, technological capabilities, availability and current use of technologies were highlighted that can certainly influence adoption decisions (Porter & Donthu, 2006; Sarker & Wells, 2003). Furthermore, these studies refer to users of technologies in healthcare, and not to potential users. They also don't consider the person's belief in using it.

It is highlighted that several models were conceptualized to assess technology acceptance and adoption, such as the TAM (Davis, 1989; Venkatesh & Davis, 2000) and later the UTAUT (Venkatesh et al., 2003; Venkatesh & Bala, 2008a), later revised and adapted over time (Venkatesh et al., 2012; Venkatesh & Bala, 2008b). Especially in relation to the age factor, the STAM was formed (Chen & Chan, 2014; Renaud & Van Biljon, 2008), a specific model that would take into consideration the older age of individuals who were faced with the need to provide for the adoption of new technologies. However, none of them includes the construct of trust (Weck & Afanassieva, 2023).

Thus, since there is a lack of research perspective on innovation adoption, we chose to investigate this issue. In fact, we often refer to the concept of utility and perceived ease of use of technology (Venkatesh & Bala, 2008a; Venkatesh & Davis, 2000), but do not consider instead that users usually decide, based on their personal experience, beliefs, and general attitudes (J. Lee et al., 2011). This especially affects older people, who have ingrained habits and tend not to recognize the usefulness of technology, seeing it more as a means of potentially decreasing social contact (Kang et al., 2010; C. Lee & Coughlin, 2015).

3. METHODOLOGY

3.1 Questionnaire and sample

The study is based on a paper-based questionnaire distributed to the elderly living in remote areas of four Italian regions: Tuscany, Lombardy, Veneto, and Calabria. The sampling was constructed to be regionally representative of the elderly population (over 65 years), living in municipalities identified as remote areas. The municipalities were classified by the SNAI (national strategy for inland areas) criteria (Barca & Lucatelli, 2014). The sampling strategy invoked a simple random typology without repetition. The required sample size was approximately 400 respondents per region. For further details please refers to Vainieri et al., (2023).

The survey was administered in paper form (PAPI - Paper And Pencil Interview) to overcome any difficulties of access for those with digital weaknesses. It was not specifically constructed to assess the level of older people's trust in health technologies, but more generally on their use of them and to investigate the possible digital divide that can arise in the elderly and in people living in rural areas. In our opinion, trust is a complex

and vague concept that cannot be directly quantified, and consequently, it can be seen as a latent variable, measured indirectly by manifest variables. Three questions out of twenty were identified within the questionnaire as benchmark indicators of trust in health technologies:

- Question No. 1: Do you think technology can help you better control your health conditions?
- Question No. 2: Do you already use health technology tools (apps, sensors, smart watches, etc.)?
- Question No. 3: Would you be willing to experiment with new technological tools to monitor your health conditions?

We believe that these questions may actually be an indicator of trust because believing useful or using a technology to control one's health or the propensity to experiment with its use in the future are specifically representative of the concept of trust in technologies which is found in the literature (McKnight et al., 2009, 2011; Rousseau et al., 1998).

3.2 Data analysis

The analysis was performed using the R 4.1.1 statistical software. Initially, we identified the responses to the three questions in the questionnaire as indicators of trust, going then for absolute frequency and response rates to understand their distribution among our population.

As in our opinion trust can be considered as a latent trait not directly measurable and with a fuzzy definition, thus we applied a latent class model for polytomous outcome to study our variable of interest. Latent structure analysis (Agresti, 2003) can be used to identify clusters of similar “types” of individuals or observations from multivariate categorical data, estimating the characteristics of these latent groups, and returning the probability that each observation belongs to each group. The model that best fits our data is a model that considers two latent classes representing trust in technology (Class 1) and non-trust in technology (Class 2).

Moreover, we also tested the different response profiles, identifying all the possible combinations. Based on the responses, we checked what are the conditional probabilities for each response profile to end up in one or the two classes.

Next, to test whether factors in our sample influence trust, compared with those typical in the literature on the introduction and adoption of new technologies, we apply univariate latent class regression models for polytomous outcome variables. The latent class regression model (Bandeen-roche et al., 1997). Further enables the estimation of the effects of covariates on predicting latent class membership.

Due to structural model requests, we had to recode some variables in the questionnaire. The variables “age”, “educational level” and “chronic health conditions” that admitted more than two responses were transformed into dichotomous variables. Specifically: the

variable “age” was divided into the young elderly group (65-74 years old) and the elderly group (75+) by aggregating the age groups 74-85 and 85+. “Education level” was divided into lower, for those who had attended elementary and middle schools, and higher, for those who had accessed high school or college. “Chronic health condition” saw the clustering of no and don't know responses as the latter response tended to be corroborated by the lack of chronicity diagnosis. Finally, in relation to regions, each regional variable was formed by comparing a given region with the other three together.

4. RESULTS

A total of 2073 elderly people living in the remote areas of four regions responded to the questionnaire by answering the three benchmark indicators on trust in health technologies reported in the methodology session. Table No. 1 shows the data and response rates for the three benchmark questions.

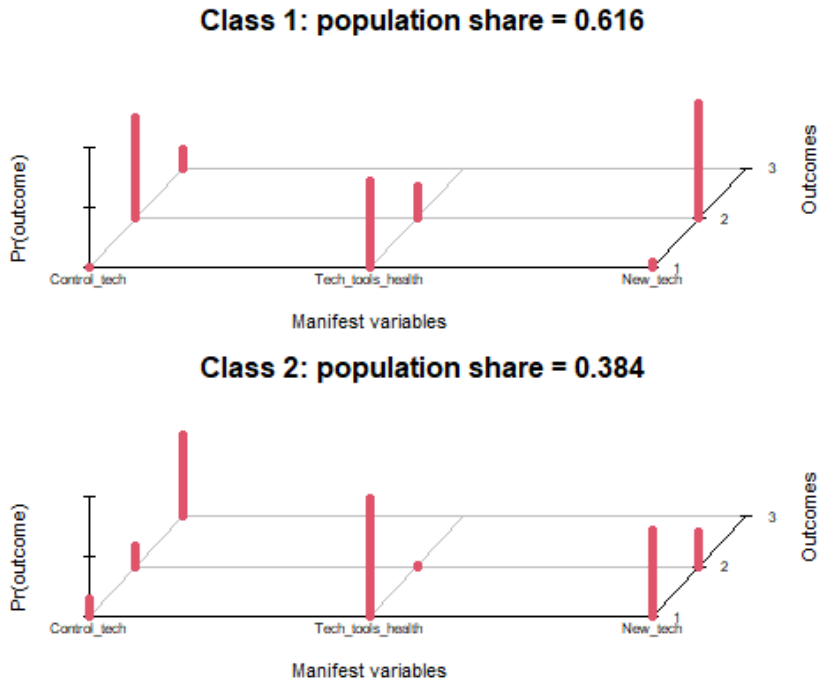
It emerges that the majority of respondents (58.03%) recognize that technology can help them control their health, while only a very small percentage (5.60%) explicitly declare that they do not consider it useful. The number of undecideds is high at 36.37%. Yet, the vast majority of respondents do not already use health technology systems (82.88%), but most participants would be willing to experience them in the future (69.61%).

Table No. 1 *Response data and percentages for the three benchmark questions to assess trust (with variable references).*

Core questions and variables	Answer NO	Percentage of NO (%)	Answer YES	Percentage of YES (%)	Answer DON’T KNOW	Percentage of DON’T KNOW (%)
Question n. 1 Control_tech	116	5.60	1203	58.03	754	36.37
Question n. 2 Tech_tools_health	1718	82.88	355	17.12	----	----
Question n. 3 New_tech	630	30.39	1443	69.61	----	----

Next, we combined the responses to the three questions to verify, in light of these, which of the two latent classes we constituted the respondents ended up in. Class 1 represents the group that trusts technologies for health purposes (Class 1=61% of respondents), while Class 2 is the group of those who do not trust (Class 2=38% of respondents). Figure No. 1 represents the graphical expression of the probability of being in a given class based on the answers provided in our multidimensional item response theory (MIRT) model.

Figure No. 1 *Graph expression of the multidimensional item response theory model reporting the probability of being in one of the two classes based on the responses to the trust baseline questions (outcome: no=1, yes=2, don't know=3).*



As can be seen, the variables related to questions 1 and 3 show a detectable difference between the two classes, with a conditional probability in relation to answer 3 concerning the future use of new technologies quite opposite between the two classes (Class 1: no=0.0470, yes=0.9530; Class 2: no=0.7161 yes=0.2839). It also turns out high for Class 2 the "don't know" answer to question 1 as mistrust tends to be regarded as lack of confidence. The variable related to the use of tools to monitor health has a high conditional probability of a "no" response in both classes. This is explained in relation to the fact that not necessarily those who trust technology then need to use such tools. Table No. 2 represents the conditional probability of response, by outcome variable, for each class.

Table n. 2 *Conditional probability of falling into any of the two classes based on responses to the baseline questions.*

Questions/Variables	Classes	Answer NO	Answer YES	Answer KNOW	DON'T
Question n. 1 Control_tech	Class 1	0.0009	0.836	0.1631	
	Class 2	0.1443	0.170	0.6857	
Question n. 2 Tech_tools_health	Class 1	0.7282	0.2718	_____	
	Class 2	0.9900	0.0100	_____	

Question n. 3 New_tech	Class 1	0.0470	0.9530	_____
	Class 2	0.7161	0.2839	_____

Moreover, for the different response profiles, 11 possible combinations result. Based on the responses, the highest conditional probability of ending up in Class 1 is combination No. 7 (p=0.9986) where "yes" is answered to all three questions, followed by combination No. 11 where "don't know" is answered to the first of the three questions and "yes" in the remaining two (p=0.9726). It should be noted that not using health technology tools slightly lowers the probability of still being in Class 1 if the other questions were answered "yes" (p=0.9513).

Table n. 3 Conditional probability of fit into one of the two classes based on the possible answers given to the three baseline questions to assess trust.

Combination	*Question n. 1*	*Question n. 2*	*Question n. 3*	*Class 1 Trust*	*Class 2 No Trust*
1	*no*	*no*	*no*	*0.0006*	*0.9994*
2	*no*	*no*	*yes*	*0.0299*	*0.9701*
3	*no*	*yes*	*yes*	*0.5362*	*0.4638*
4	*yes*	*no*	*no*	*0.2760*	*0.7240*
5	*yes*	*no*	*yes*	*0.9513*	*0.0487*
6	*yes*	*yes*	*no*	*0.9346*	*0.0654*
7	*yes*	*yes*	*yes*	*0.9986*	*0.0014*
8	*don't know*	*no*	*no*	*0.0181*	*0.9819*
9	*don't know*	*no*	*yes*	*0.4861*	*0.5139*
10	*don't know*	*yes*	*no*	*0.4091*	*0.5909*
11	*don't know*	*yes*	*yes*	*0.9726*	*0.0274*

Then, as for the factors that may or may not influence trust in new health technologies, we tested their significance in our univariate latent class regression models for polytomous outcome variables. In our sample, it emerges that only the variables "age" and "educational level" were found to be significant, while "gender", "chronic health conditions", and "regions" were not significant. Table No. 4 shows the distribution of respondents divided according to the covariates used for the analysis performed.

Table n. 4 *Distribution of respondents by variables used for the analyses (absolute frequency and percentage)*

Gender	*male*	*female*
	1042 (50.27%)	1031 (49.73%)
Age	*65-74*	*75+*
	1143 (55.14%)	930 (44.86%)
Educational level	*lower*	*higher*

	1510 (72.84%)	563 (27.16%)		
Health Chronic Conditions	*no* 846 (40.81%)	*yes* 1227 (59.19%)		
Regions	*Lombardy* 496 (23.93%)	*Veneto* 597 (28.80%)	*Tuscany* 308 (14.85%)	*Calabria* 672 (32.42%)

5. DISCUSSION AND CONCLUSION

Our study has the merit of analyzing, for the first time at the Italian level, the issue of trust in new digital technologies in healthcare in elderly. Trust plays a vital role in the willingness to embrace technology and rely on it for healthcare needs (Dhagarra et al., 2020; Liu et al., 2023; Montague et al., 2010; Zulman et al., 2011), on par with other factors such as perceived usefulness and ease of use might be (Davis, 1989; Venkatesh et al., 2003).

Indeed, the findings show that the elderly in our sample mostly tend to trust health technologies, believing that they can be useful in monitoring their health conditions and would be willing to use them in the future. Although only a portion of them, in fact, responded that they already use wearable devices, this did not influence whether they might decide to use them in the future. These could be important in terms of providing essential insights into the market of the healthcare sector, and also in light of future prospective evaluations on research and development (Weck & Afanassieva, 2023).

In addition, it is certainly interesting to note that “age” and “educational level” are significantly relevant in our sample, going to confirm what has been reported in other studies (Joyce & Loe, 2010; Peine et al., 2021; Porter & Donthu, 2006), Vainieri et al. 2023(Joyce & Loe, 2010; Peine et al., 2021; Porter & Donthu, 2006), Vainieri et al. 2023. Health status seems not to be a significant moderating factor affecting trust, having to be assumed that it is not directly related to chronic conditions and consequently the need for increased use of devices to control it. In comparison with other studies, however, no differences were found in terms of "gender" (Buchan et al., 2008; Omrani et al., 2022) or even at the level of geographic area. This last point notes how in Italy in remote areas there is no significant difference around territories in terms of trust in digital technology, going to confirm another study (Vainieri et al., 2023) that has shown that the propensity to use is not affected by geographic factors in remote areas, but instead, the actual use of technological tools is, considering the intrinsic organizational differences between regions.

Overall, the fact that the elderly population is likely to use digital solutions for healthcare in the future suggests that policies can be constituted to incentivize the elderly to come more confident and to effectively use healthcare technologies since the relationship between the elderly and technology offers numerous opportunities to improve healthcare delivery, outcomes and support the well-being. There is also a need to try to increase digital literacy, whether using easily intelligible platforms (Frishammar et al., 2023; Pirrotta et al., 2022; Rodriguez et al., 2022) or social interactions (Bozan et al., 2016;

Cimperman et al., 2016). Indeed, if initial trust does not come from previous experiences in the field (Mcknight et al., 1998), but from attitudes toward a given technology, the elderly could be incentivized to trust health technology tools, even representing to them how they can become a method of greater autonomy (Piau et al., 2014), as well as a tool nonetheless under their complete control (Shareef et al., 2021).

However, our study has some limitations. First, we point out the study is specifically aimed at elderly users living in remote areas, who were targeted because this specific group is the recipient of several policies related to digital health in Italy. Therefore, our results should be interpreted with caution for applications in other populations and age groups. Second, it was not possible to investigate all the factors influencing trust in the literature (i.e., income), since the current survey was not specifically calibrated to assess trust, but more about barriers and propensity to use new technologies.

Future research may focus on the topic of trust in technologies in health care among different population groups, being able to also investigate the gaps between the different target groups and the additional factors that could not be tested in this study, such as whether the presence of a social community may change users' attitudes or not.

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