# ADOPTING AND USING SUPPORTIVE DIGITAL TECHNOLOGIES TO ENHANCE HEALTHY AGEING PRACTICES

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***ABSTRACT***

*Population aging is bringing new challenges to our society, especially in health protection and medical care. To this end, supportive digital technologies can definitely provide with a number of solutions to improve healthy ageing practices. Our study focuses on a specific class of supportive digital technologies, namely Virtual Coaching Systems (VCSs). By drawing on empirical evidence coming from a survey delivered to 560 Italian elderly individuals aged 60+, we advance a framework and test a structural equation model unveiling how the exploitation of heterogeneous sources of knowledge through supportive digital technologies – i.e. VCSs – can be instrumental to promote healthy ageing and, thus, contributing to the sustainability of national healthcare systems. We contribute to theory by extending the original formulation of Technology Acceptance Models in that we include three new external determinants – subjective norms, health literacy, and information technology literacy. Theoretical and practical implications are discussed.*

***Keywords****: digital technologies; virtual coaching systems; technology acceptance model*

## 1. INTRODUCTION

In 2015, the World Health Organization (WHO)[1] introduced the concept of "*Healthy Ageing*", intended as the process through which an individual can maintain or enhance her/his well-being within the ageing process. Furthermore, the COVID-19 pandemic exacerbated the gaps in policies, systems and services.

In this regard, it is increasingly recognized that digital technologies can play a powerful role because they can integrate and manage the expertise needed to support well-being in a cost-effective manner (Gastaldi et al., 2018; Liobikiene & Bernatoniene, 2018; Palumbo et al., 2016; Pinzone et al., 2020). Digital technologies are becoming pervasive, giving rise to the fourth industrial revolution[2] and digital transformation (Appio et al., 2021).

Our study focuses on a specific class of supportive digital technologies, namely Virtual Coaching Systems (VCSs). They represent a paradigmatic example of supportive digital technologies applied to individuals' decision-making that are based on Artificial Intelligence and heterogeneous sources of knowledge, such as clinical guidelines, lifestyle behaviours, etc (Bevilacqua et al., 2020; Tsiouris et al., 2020). VCSs leverage real-time data gathering and processing capabilities to guide the user through repeated interactions, feedback and recommendations based on behavioural theories operationalized in an action plan (Kamphorst, 2017).

[1] http://www.who.int/ageing/events/world-report-2015-launch/en/

[2] https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/

Within this background, our study aims at better understanding how the exploitation of heterogeneous sources of knowledge through supportive digital technologies – i.e. VCSs – can be instrumental to promote healthy ageing and, thus, contributing to the sustainability of national healthcare systems. In particular, this study sheds novel light on the determinants that shape elderly individuals' intention to use a VCS for healthy ageing purposes, targeting people aged 60+. Then, a research question of strategic importance emerges and lead our empirical investigation: *what are the determinants of adopting and using VCSs to enhance healthy ageing practices?*

By adopting the Technology Acceptance Model (TAM) by Davis (Davis, 1989) as overarching theory to apply to the case of VCSs and collecting data through an online survey administered in Italy to 560 elderly individuals aged 60+ between June and August 2018, we contributed by extending its original formulation through the inclusion of three external determinants (*Subjective Norms* (Yi et al., 2006), *Health Literacy* (Liobikiene & Bernatoniene, 2018; Palumbo et al., 2016; Pinzone et al., 2020) and *Information Technology Literacy* (Lynch, 1998)) improving its predictive power.

## 2. THEORETICAL BACKGROUND

The development of our theoretical model is grounded into two main streams of research. On one hand, we reviewed past studies about the development and the impact of VCSs, which fall the intersection of information science, medicine, and healthcare management research. On the other hand, we reviewed past contributions about user acceptance, with particular attention to the theories stemming from the original study by Davis, 1989.

### *2.1 VIRTUAL COACHING SYSTEMS*

Generally speaking, the adoption and use of coaching systems is gaining momentum for both every day and medical applications (Tsiouris et al., 2020). A number of reasons exist for their increasing popularity and include increasing reliable internet access; the growth of access to cheaper smart devices (Farahani et al., 2020); the emergence of design and development revolving around seamless interconnectivity among devices (i.e., Internet of Things) (Woo et al., 2018); technology acceptance, as people are becoming increasingly acquainted and aware of the beneficial aspects provided by their functionalities (Dimitrov, 2016); and the continuous increase in mobile and edge processing power, which widens the landscape of possibilities of can be done in practice (Ojo et al., 2018)

There are many definitions of a VCS. Albaina et al., 2009 described it as a system that contributes to motivate, stimulate, encourage, persuade an individual in changing her behaviour towards a specific goal. Similarly, Fasola & Matarić (2013) described a VCS as a social agent that can interact, engage, motivate the individual in her personal tasks. Kamphorst (2017) stated that the VCS is "a set of computerized components that constitutes an artificial entity that can observe, reason about, learn from and predict a user's behaviours, in context and over time, and that engages proactively in an ongoing collaborative conversation with the user to aid planning and promote effective goal striving through the use of persuasive techniques".

Considering the domain of application, VCSs have been applied to some healthy ageing domains. Past studies mainly dealt with promoting and improving the levels of physical activity (Segerståhl & Oinas-Kukkonen, 2011); nutrition (Fasola & Matarić, 2013; Ochoa & Gutierrez, 2018), physical activity motivation for the elderly individuals (Bickmore et

al., 2013), while other studies focused on VCSs' ability to support social interactions or cognitive maintenance over time (Morris, 2007).

### *2.2 USER ACCEPTANCE TECHNOLOGY*

As the use of VCS is mainly intentional, it is very important to understand how to enable this behavior.
The most respected theory about user acceptance of a technology to pursue a specific task has been developed by Davis (Davis, 1989) and is known as Technology Acceptance Model (TAM). TAM was developed within the theoretical domains of information science and first works dealt with the modelling of users' acceptance of information systems or technologies.
Within the TAM theoretical modelling, behavioural Intention to Use (ITU) a technology for pursuing a specific goal has two main antecedents – *Perceived Usefulness* (PU) and *Perceived Ease of Use* (PEU). PU represents "the degree to which an individual believes that using a system would enhance her job performance" (Davis, 1989). The more the individual perceives that the technology can enhance his/her performance, the more he/she will be willing to use it. PEU represents "the degree to which a person believes that using a system would be free of effort" (Davis, 1989). This means that using the technology, the person feels free from difficulties and complications. Additionally, TAM posits PEU to have a positive influence on PU.

When it comes to VCSs, past studies mainly dealt with two domains, i.e. disease management and wellbeing maintenance. Concerning the first domain, past contributions investigated the determinants that shaped the intention to use technological systems to manage specific health-related issues, e.g., diabetes (Maniam et al., 2015). With respect to the well-being maintenance, the literature offers a limited number of studies that investigated a few determinants, such as trust and privacy (Kalantari, 2017). Notwithstanding the value of existing contributions, the debate is still far from clarifying whether and how VCSs support and enhance ageing health practices.

## 3. HYPOTHESES DEVELOPMENT

We developed our theoretical framework, grounded in the original formulation of TAM (Davis, 1989), in order to identify the main determinants that shape the intention of elderly individuals to use a VCS for engaging in healthy ageing behaviours. However, the use of VCSs needs to be considered as a long-term health-promoting behaviour, rather than a mere adoption of a new technology (Lee & Lee, 2018). Therefore, we extend the original formulation of TAM by investigating the role played by three additional determinants that were found significant within the literature for health-related behaviours: subjective norms, health literacy, and information technology literacy.

First, we considered the social influence exerted by people of importance to the elderly individual, conceptualised as *Subjective Norm* (SN) (Yi et al., 2006). Second, we introduced *Health Literacy* (HL), considered as the degree to which an individual perceives to be able to find, process, and understand health-related information to ground his/her decisions (Liobikiene & Bernatoniene, 2018; Palumbo et al., 2016; Pinzone et al., 2020). Third, we included the elderly individual's *Information Technology Literacy* (ITL), intended as the degree to which and he/she perceives to be confident in using a technological device in order to perform a desired task (Lynch, 1998).

Figure 1 offers an overview of our theoretical framework with the main hypotheses, which are introduced in the following paragraphs.

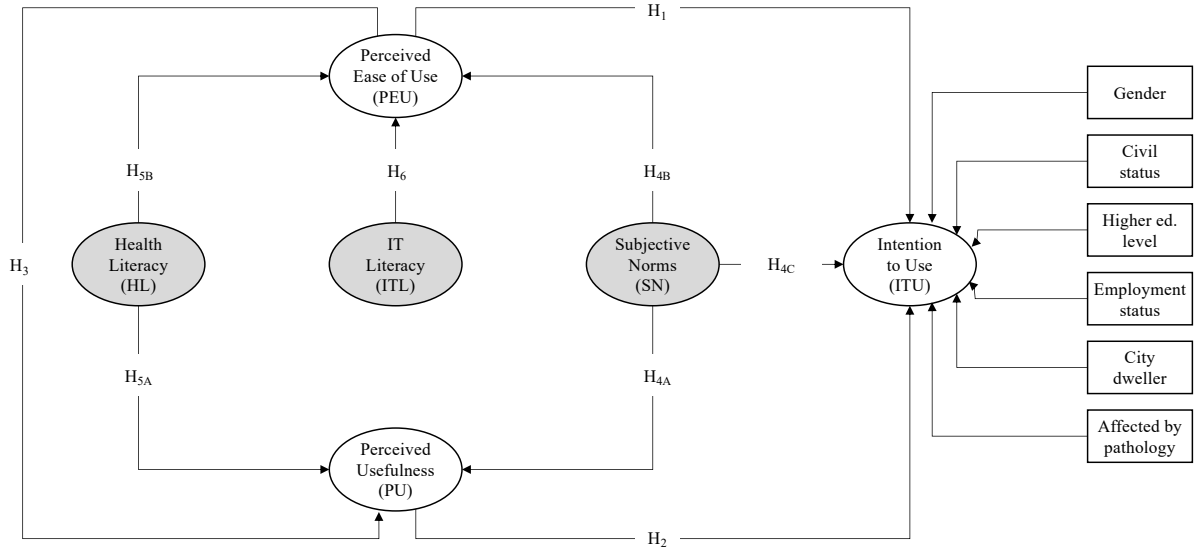


**Figure 1. Theoretical model and hypotheses**

### *3.1 HYPOTHESES FROM THE TECHNOLOGY ACCEPTANCE MODEL*

Numerous past studies confirmed the underlying hypotheses of the TAM theory in healthcare (Knox et al., 2021; Li, 2020). Furthermore, TAM-based contributions reported evidence of the positive influence of both PEU and PU on the ITU well-being devices, wearable technologies, information systems (Schomakers et al., 2018). The rationale is quite intuitive in that individuals want to use systems or technologies that are beneficial to their current situation, while not spending a lot of energy in learning how to use them. This is consistent with the promise of VCSs. Accordingly, we advance the following two hypotheses:

*$H_1$: Perceived Ease of Use has a positive influence on the Intention to Use a virtual coaching system for healthy ageing.*
*$H_2$: Perceived Usefulness has a positive influence on the Intention to Use a virtual coaching system for healthy ageing.*

Furthermore, TAM posits PEU to have a positive influence on PU and this has also been widely confirmed by previous studies in healthcare (Liu et al., 2013; Weng, 2016). Empirical evidence concerning the directionality of this relationships is lacking when VCSs are considered. However, it is reasonable to formulate the following hypothesis concerning VCSs in that the underlying logic resonates well with the adoption of other systems or technologies:

*$H_3$: Perceived Ease of Use has a positive influence on the Perceived Usefulness of a virtual coaching system for healthy ageing.*

### *3.2 SUBJECTIVE NORMS*

Subjective Norms (SN), which can be thought of as the social influence of people who are perceived as relevant by the individual, can affect significantly the intention to use of

a novel technology (De Benedictis et al., 2020; Yi et al., 2006). SNs can influence the intention to use a VCS both directly and indirectly. As former studies highlight, elderly individuals in particular, who do not own commonly a consistent background on new digital technologies, can be influenced favourably by their family members' (Teo & Pok, 2003) as well as doctors' (Liobikiene & Bernatoniene, 2018) opinions. Although this situation is undergoing profound changes, an important gap may still exist, making the opinion of elderly individuals' closest entourage playing an important role. Furthermore, additional contributions showed that others' opinions can affect positively the intension to use health information technologies through PU and PEU (Cho et al., 2014; J. Kim & Park, 2017) because these opinions can be useful in developing a deeper understanding of the type, characteristics, and functioning of the technology (Hartwick & Barki, 1994). Accordingly, we formulate the following hypothesis:

*$H_4$: Subjective Norms have a positive influence on the Intention to Use a virtual coaching system for healthy ageing. (a) Perceived Usefulness and (b) Perceived Ease of Use partially mediate the relationship.*

### *3.3 HEALTH LITERACY*

Health Literacy (HL) refers to how an individual obtains, understands, uses, and communicates health information to make informed decisions (Mackert et al., 2016). HL is based on basic reading, processing, and understanding of health information (Y.-C. Kim et al., 2015), and the individuals who possess those skills will require minimal effort to use technological devices for their healthy ageing necessities. In this vein, Aydın et al., 2015 proposed that a person should have a high level of HL to access correct health information. Because of the lack of basic reading ability regarding health information, it will not be as easy for those with a low level of HL to seek health information in their everyday lives (Y.-C. Kim et al., 2015). Mackert et al., 2016 found that people with a higher HL perceived health information technology as more useful and easier to use. Similarly, the ability to gather and interpret health information was found to be related to the perceived easiness of using online health Apps (Teo & Pok, 2003). Accordingly, it is reasonable to expect that:

*$H_5$: When it comes to adopt a virtual coaching system for healthy ageing, Health Literacy has a positive influence on both the (a) Perceived Usefulness and (b) Perceived Ease of Use.*

### *3.4 INFORMATION TECHNOLOGY LITERACY*

Information Technology Literacy (ITL) refers to the perception of the individuals of their ability to use a digital device (Lynch, 1998). The few previous studies that investigate the ITL construct, show that there is a positive relationship between ITL and intention to use of specific technologies (Weng, 2016). Accordingly, we hypothesized what follows:

*$H_6$: Information Technology Literacy positively affects Intention to Use a virtual coaching system for healthy ageing through the mediation of Perceived Ease of Use*.

## 4. METHODOLOGY

### *4.1 SAMPLE AND DATA COLLECTION*

To test the hypotheses, we collected data through an online survey administered in Italy to people aged 60+ between June and August 2018. The choice of this age group is due to the peculiar characteristics of the target respondents (especially in terms of the adopted explanatory variables), which are not comparable to younger age groups, although their viewpoint could be relevant as they are the potential future users of these technologies. The questionnaire was written in Italian to facilitate elderly individuals' response. Data were collected through an online platform and the questionnaire was administered among the subscribers of a newsletter of elderly people and further distributed on social media, such as Facebook. Data collection and processing were compliant to the European General Data Protection Regulation (GDPR)[3]. On average the completion time was 15 minutes. We collected 560 complete responses. After a quality check, we eliminated the questionnaires with inconsistent answers or with a high number of missing answers. The final sample was composed of 436 high-quality answers. Overall, 37% of the respondents were male, 46% had a post-secondary education level, 45% were still employed, and 68% were married or living with someone else.

### *4.2 MEASURES*

All constructs – ITU, PEU, PU, SN, HL, and ITL – were measured by adapting previously published scales (Table 1) (Davis, 1989; Yi et al., 2006). Unless otherwise indicated, responses were on a five-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). Table 1 report the various constructs, items and the relative Cronbach's alpha.

| Constructs[A] | Items | Cronbach's α |
|---|---|---|
| Intention to use (ITU)<br><br>(Sun & Zhang, 2006) | • $ITU_1$: I would consider the use of solutions and new technologies that would guide me in enhancing my lifestyle and daily activities<br>• $ITU_2$: I would consider the use of a mobile application that guides me towards the maintenance of my physical well-being<br>• $ITU_3$: I would consider the use of a mobile application that would guide me towards the maintenance of my cognitive well-being<br>• $ITU_4$: I would consider the use of a mobile application that would guide me towards the maintenance of my social well-being and of my relations<br>• $ITU_5$: I would consider the use of a mobile application that would guide me towards the maintenance of my cognitive abilities<br>• $ITU_6$: I would consider the use of a mobile application that would guide me towards the control and management of my eating habits | 0.9126 |

[3] https://eur-lex.europa.eu/eli/reg/2016/679/oj

| | | |
|---|---|---|
| Perceived Ease of Use (PEU) (Davis, 1989) | • $PEU_1$: Using applications for the control of the life style would be easy for me<br>• $PEU_2$: I would be able to use solutions and new technologies to control of my life style in daily activities<br>• $PEU_3$: I would have the right competencies required to use solutions and new technologies for the control of my life style in my daily activities<br>• $PEU_4$: I would have the resources required to use solutions and new technologies for the control of my life style in my daily activities | 0.8273 |
| Perceived Usefulness (PU) (Davis, 1989) | • $PU_1$: Using a digital application for the control of health would bring benefits to my well-being<br>• $PU_2$: Using a mobile application for the management of the health status would make people more active and conscious in taking decisions concerning health | 0.8550 |
| Subjective Norm (SN) (Yi et al., 2006) | • $SN_1$: My relatives think that it would be useful for my health to use a mobile application that helps me to control my life style<br>• $SN_2$: My doctor thinks that it would be useful for my health to use a mobile application that helps me to control my life style<br>• $SN_3$: My friends think that it would be useful for my health to use a mobile application that helps me to control my life style | 0.8961 |
| Health Literacy (HL) (Sørensen et al., 2012) | • $HL_1$: I find it easy to find out how to maintain my physical well-being<br>• $HL_2$: I find it easy to find out how to maintain a balanced diet<br>• $HL_3$: I find it easy to find information concerning the activities that can have a positive impact on my well-being (e.g. meditation, gymnastic courses, walking)<br>• $HL_4$: I find it easy to understand the daily behaviour (eating habits or physical exercise) that are related to my health | 0.8087 |
| IT Literacy (ITL) (Coles, 1998) | Two items obtained by counting the number of Apps used by the respondent<br>• $ITL_1$: Which of the following apps do you use? Information, Fitness, Nutrition, Brain Game, Web Surfing<br>• $ITL_2$: Which of the following social network do you use? Facebook, Whatsapp, Instagram, Twitter, Snapchat | 0.7349 |
| 6 binary control variables | Gender (male, female); Civil Status (married, not married); Higher education level (has, has not); Employment status (employed, unemployed); City dweller (yes, no); Affected by pathology (yes, no) | |

[A] The theoretical source of the various constructs are represented in square parentheses

[B] For each item it was asked how the respondent agreed with the relative sentence on a scale from 1 to 5 (1 = strongly disagree; 2 = agree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree)

**Table 1. Constructs and relative items**

### *4.3 DATA ANALYSIS*

Our model was tested through Structural Equation Modelling using the statistical software STATA v14. The validity of constructs and the significance of hypothesized relationships among the latent variables were respectively verified through the output of the measurement and the structural model. As a final step, the goodness of fit of the proposed model was assessed considering both absolute and relative fit indexes. Four indexes were considered as recommended by the academic literature, i.e., the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Residual

(SRMR), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI). As reported in Table 3, all indexes' values are in line with common values accepted in the literature (Hair et al., 2010).

| Index | Value | Suggested Threshold |
|---|---|---|
| RMSEA | 0.06 | < 0.07 |
| SRMR | 0.05 | < 0.08 |
| CFI | 0.91 | > 0.90 |
| TLI | 0.91 | > 0.90 |

**Table 3. Goodness of Fit Indexes**

## 5. RESULTS

### *5.1 MEASUREMENT MODEL*

Table 2 shows the Average Variance Extracted (AVE) and the Composite Reliability (CR) for all constructs included in the structural equation model. The values are higher than commonly accepted thresholds (equal to 0.50 and 0.70 respectively) (Hair et al., 2010), indicating a good validity for all constructs.

| Construct | Id | Factor Loading | AVE | CR |
|---|---|---|---|---|
| Intention To Use (ITU) | $ITU_1$ | 0.7464 | 0.6420 | 0.9146 |
| | $ITU_2$ | 0.8546 | | |
| | $ITU_3$ | 0.8541 | | |
| | $ITU_4$ | 0.7243 | | |
| | $ITU_5$ | 0.8275 | | |
| | $ITU_6$ | 0.7908 | | |
| Perceived Usefulness (PU) | $PU_1$ | 0.8892 | 0.7105 | 0.8303 |
| | $PU_2$ | 0.7939 | | |
| Perceived Ease of Use (PEU) | $PEU_1$ | 0.7850 | 0.5973 | 0.8549 |
| | $PEU_2$ | 0.8672 | | |
| | $PEU_3$ | 0.7374 | | |
| | $PEU_4$ | 0.6909 | | |
| Subjective Norm (SN) | $SN_1$ | 0.8377 | 0.7520 | 0.8746 |
| | $SN_2$ | 0.8372 | | |
| | $SN_3$ | 0.9238 | | |
| Health Literacy (HL) | $HL_1$ | 0.7336 | 0.5227 | 0.8136 |
| | $HL_2$ | 0.6497 | | |
| | $HL_3$ | 0.7452 | | |
| | $HL_4$ | 0.7584 | | |
| IT Literacy (ITL) | $ITL_1$ | 0.7619 | 0.6083 | 0.7564 |
| | $ITL_2$ | 0.7976 | | |

**Table 2. Confirmatory Factor Analysis (CFA)**

### *5.2 STRUCTURAL MODEL*

Figure 2 shows the structural model.

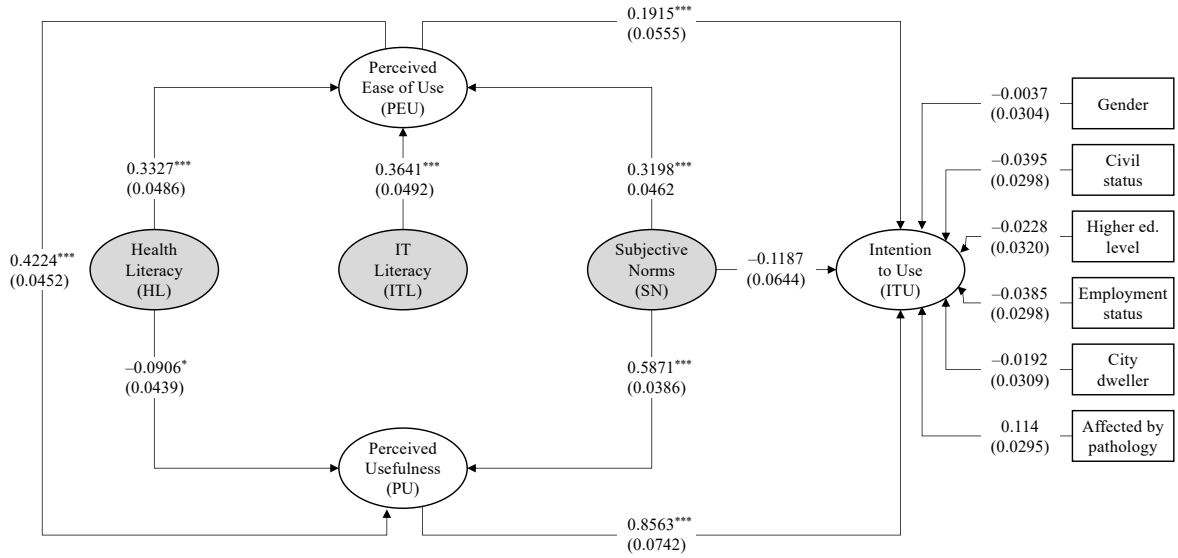


**Figure 2. Structural Equation Model**

Notes: Standardized coefficients are reported, with standard errors in the parentheses. * p < 0.1; ** p < 0.05; *** p < 0.01.

Accordingly, it turns out that none of the control variables influence the ITU a VCS. On the other hand, the path coefficients for our TAM-related hypotheses show that both PU (β=0.86; p≤0.001) and PEU (β=0.19; p≤0.001) have a positive and significant impact on the respondent's ITU of VCSs. Therefore, $H_1$ and $H_2$ are supported. Moreover, the result shows that PEU has a positive and significant impact on PU (β=0.42; p≤0.001) and, thus, $H_3$ is also supported.

Concerning SN, the result shows that $H_4$ is partially supported. SN are not found to have a significant direct impact on ITU (β=0.12; p>0.1), while they have an indirect influence through PEU (β=0.32; p≤0.001) and PU (β=0.59; p≤0.001).

Similarly, the data partially support our $H_5$. On one hand, and contrary to our expectations, HL is found to have a significant but negative impact on the PU of a VCS (β=0.09; p≤0.05). On the other hand, it positively and significantly affects PEU (β=0.33; p≤0.001).

Finally, the results of the analysis provide support for the positive relationship between ITL and PEU (β=0.36; p≤0.001). Therefore, $H_6$ is supported.

## 6. DISCUSSION

### *6.1 THEORETICAL CONTRIBUTIONS*

Our results confirm the basic linkages posited by the TAM theory (Davis, 1989). In fact, the higher the PEU of a VCS, the higher its ITU. Similarly, the higher the perception that the use of a VCS will bring effective improvements with respect to healthy ageing, the

higher its ITU. These findings are aligned to past studies that applied TAM to the healthcare context (Kalayou et al., 2020; Knox et al., 2021).
As original contribution, we found that the direct relationship between SN and ITU is not significant. Contrary to the hypothesis we formulated, this result implies that the degree to which important people to the elderly individual judge positively (or not) the use of a VCS does not directly influence his/her adoption. This finding is aligned with (Lee & Lee, 2018) who observed that interpersonal influences indirectly impact the ITU a wearable fitness tracker. Similarly, we found the relationship between SN and ITU is fully mediated by PU and PEU. Given the target population and the voluntariness of using a VCS, we can assume that the positive (or not) opinions of friends, family members, and doctors have an impact on the ITU of a VCS only when they are fully internalized in elderly individuals' belief structure (Yi et al., 2006). Additionally, the opportunity of receiving help and indications by friends, family members, and doctors on how to use the technology can contribute to the perception that its actual use is manageable and easy.
Contrary to expectations, our novel evidence suggests a negative influence of HL on the PU of a VCS: a higher level of HL has a negative impact on the PU of the system. One possible interpretation for this result is that if an elderly individual already has a good capability to find information about her personal well-being and a good degree of understanding of such information, he/she would find it unnecessary and of little value added to use an additional digital tool to maintain the well-being. We can argue that TAM may not be a one-size-fits-all model for all technological solutions; rather, it seems that specific technological solutions – e.g., VCSs – may act as boundary conditions to its applicability. It is highly likely the domain of supportive digital technologies, of which VCSs are only one example, which normally have an inherent high social value, may require a deeper future investigation on the nature of TAM. On the other hand, our results confirm that a higher level of HL leads elderly individuals to perceive the VCS as easier to use. This result is coherent to previous studies in the field of e-health (Cho et al., 2014).
Finally, our results offer significant support of the positive relationship between ITL and PEU. This result is consistent to the theoretical arguments according to which a good level of familiarity with technological devices increases the ease of use of personal health and lifestyle digital systems (Kalantari, 2017; Lee & Lee, 2018).

### *6.2 PRACTICAL CONTRIBUTIONS*

Our results highlight important contribution to practice. In fact, health policymakers, healthcare professionals, and providers of digital solutions for elderly individuals' healthy ageing might benefit from the novel evidence gathered in this study. The first suggestion deals with the design as well as the sponsoring of a solution that seems easy to use and in which the CVS is perceived as easy to follow. Indeed, when searching for a VCS, the potential user who is aged 60+ should have the perception of an easy-to-use tool. This goal can be achieved by showing that only a few steps are required to engage with the system as well as by communicating that only a limited amount of data will be required to initiate the coaching program. Furthermore, a graphical interface that conveys an idea of simplicity could increase even more this perception. Second, health professionals and policy makers are advised to make the actual utility of these VCSs more evident to the users to increase their adoption. They should act to make elderly individuals aware of the actual benefits of virtual coaching, for example by sponsoring successful cases of application. Similarly, about HL and its negative effect on the PU, system developers and healthcare professionals need to provide clear evidence of the effective benefits and value

added driven by the ability of such systems to act upon the behaviour of an individual. Moreover, a significant degree of personalization can provide subjects with a higher level of HL more challenging feedbacks that are perceived as new and useful. The knowledge exploited by the VCS must derive from professional sources and go beyond what citizens learn from their individual search. To add more on this point, VCSs and comfortable human–computer interfaces, based on user-based AI measures, have the ability to promote active information processing and adoption with regard to motivation and behavior changes (Kreps & Neuhauser, 2013). Finally, policy makers should support the development of educational programs to better equip elderly individuals with the digital skills to use the VCSs and avoid the exacerbation of the 'digital divides' that unethically exclude those who have low digital literacy (Liobikiene & Bernatoniene, 2018; Palumbo et al., 2016).

## 7. LIMITATIONS AND FUTURE RESEARCH

This paper does not come without limitations that, at the same time, represent fruitful avenues for future research efforts.

First, since we implemented a cross-sectional design, we cannot offer definitive conclusions on causation. Although past contributions supported the development of our hypotheses, longitudinal research would be useful in establishing causality.

Second, data were collected by means of an online survey. Even if the problem does not seem to be that relevant anymore – as the World Economic Forum recently showed[4] – it still implies that elderly individuals with limited access to the Internet or low digital skills may have been underrepresented in the final sample, which may not be perfectly representative of the entire population. Moreover, our data come from a single country (Italy). Hence, the generalizability of our results should be proven by future research in different contexts.

Finally, because of the unexpected negative effect of HL on the Intention to Use of VCSs, and because our construct focused on the well-being information domain, it could be interesting to further investigate the role of HL, for example considering other dimensions.

## 8. CONCLUSIONS

In conclusion, despite the above-mentioned limitations, our results support the empirical evidence coming from extant literature but sheds also novel light on the role of three external determinants – subjective norms, health literacy, information technology literacy – and the inner mechanisms that shape elderly individuals' intention to use a specific class of supportive digital technologies – VCSs – for healthy ageing practise. In doing so, it contributes to the theoretical and practical understanding of users' discretionary acceptance of supportive digital technologies as a means of pursuing health-related goals. Moreover, our results provide health policymakers, healthcare professionals, and technology developers with evidence-based recommendations on how to enable population-wide, healthy ageing interventions through supportive digital technologies.

[4] https://www.weforum.org/agenda/2019/07/no-longer-just-for-the-young-70-of-seniors-are-now-online

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