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Exploring healthcare workers' intentions to volunteer in digital healthcare services for underserved communities: An extended TAM-based study

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ABSTRACT

Underserved communities face persistent challenges due to limited access to healthcare services. Digital volunteering offers opportunities for healthcare professionals to support these populations remotely. This study examined factors associated with healthcare workers' intentions to participate in digital healthcare volunteering in Algeria. An extended technology acceptance model was used, incorporating perceived organizational support (OS), altruism, and social responsibility. A convenience sample of 142 healthcare workers completed a survey, and hierarchical regression analysis was conducted. Results indicated that perceived ease of use, social responsibility, altruism, perceived OS, and perceived usefulness were each significantly associated with intentions to engage in digital volunteering. The extended model explained 75.6% of the variance in intention, highlighting the relevance of psychological, organizational, and ethical factors. These findings provide insights for policymakers, healthcare organizations, and developers seeking to support digital volunteering initiatives. Limitations include the cross-sectional design and the use of convenience sampling, which may affect generalizability. Future research should consider longitudinal designs, larger and more diverse samples, and cross-cultural comparisons to validate and extend these findings.

Keywords: organizational support, altruism, social responsibility, health equity, digital health, telemedicine, health disparities, healthcare access, social marketing, Algeria

INTRODUCTION

Despite government efforts to reduce health disparities, achieving equity in healthcare remains challenging due to numerous obstacles, including a lack of human and material resources [1]. While digital technologies such as artificial intelligence and the Internet of things have significantly improved the quality of healthcare services [2], residents of underserved areas have been less likely to benefit from these advancements. These populations often face isolation, limited transportation options, poverty, and inadequate access to healthcare services. Volunteering—particularly in the health sector—is a cost-effective activity that has historically played a vital role in mitigating the negative effects of various crises, including natural disasters, armed conflicts, and health emergencies such as epidemics [3-5]. Volunteering has been defined as "any action in which one individual, team or organization willingly gives their time to help another person, group or institution" (p. 2) [6].

In recent years, however, digital technologies have transformed the traditional model of volunteering, giving rise to a new generation of volunteers who utilize digital platforms to offer their support [7]. This phenomenon—often referred to as "digital volunteering", "virtual volunteering", or "online volunteering"—has expanded the scope and reach of volunteer activities. Accordingly, we argue that this emerging form of volunteering holds tremendous potential to help reduce health disparities in disadvantaged and underserved communities. In this context, it was reported that digital health volunteering (DHV) "can contribute to reducing health inequalities and facilitate access to care in isolated areas, which may positively affect the integrated digital healthcare system" (p. 288) [7].

Furthermore, the study in [8] questioned whether physicians' motivations for engaging in traditional health volunteering are the same as for DHV. In the era of modern volunteering, the study in [9] points out that both the forms and motivations for volunteering have changed, arguing that contemporary volunteering is often driven by individual preferences and tends to be occasional or short-term in nature. The study in [10] state that, in order to increase participation

rates and enhance the ability to effectively identify potential volunteers, it is essential to understand the key determinants of volunteering. Although the available literature on digital volunteering, it was noted in their review that research into the digital volunteering still needs further exploration [11]. Similarly, the study in [7] emphasizes the importance of identifying the drivers of digital volunteering among healthcare practitioners and highlight the need for further research in this area.

Previous research has primarily focused on understanding the drivers and impacts of traditional health volunteering among medical students, doctors, and nurses [12, 13]. However, few studies have explored digital volunteering [7, 14, 15], particularly DHV in the context of underserved communities that are in urgent need of such initiatives. Moreover, the technology acceptance model (TAM), developed in [16], aims to explain adoption intentions through two core constructs: "perceived usefulness" (PU) and "perceived ease of use" (PEOU). This model has been widely applied in the healthcare sector to understand technology acceptance, and scholars have extended it with various psychological, organizational, and contextual factors to enhance its predictive power.

Accordingly, the present study applies the TAM and extends it by incorporating three additional constructs: organizational support (OS), altruism, and social responsibility. Based on this framework, the investigation addresses the following research questions (RQs):

RQ1. How are PEOU and PU associated with healthcare workers' intentions to engage in DHV for underserved communities?

RQ2. Does incorporating OS, altruism, and social responsibility into the TAM improve the model's ability to account for healthcare workers' willingness to engage in DHV?

Accordingly, this study has three main objectives:

(1) To examine the associations between PEOU, PU, and healthcare workers' intentions to volunteer digitally.

(2) To assess how OS, altruism, and social responsibility are related to digital volunteering intentions.

(3) To extend the TAM to provide a more comprehensive understanding of the factors associated with healthcare professionals' engagement in digital volunteering for underserved communities.

THEORETICAL BACKGROUND AND DEVELOPMENT OF HYPOTHESES

Health Volunteering for Underserved Communities

Health volunteering plays a critical role in addressing healthcare disparities and gaps in service delivery, particularly in remote and underserved regions [1, 8]. One of the major advantages of DHV is its ability to reach geographically dispersed and resource-constrained populations [7]. In countries with vast territories, such as Algeria—which spans approximately 2.38 million square kilometers—a considerable portion of the population, especially those in rural and desert areas, continues to face significant shortages in healthcare infrastructure and medical personnel. These disparities underscore the urgent need for alternative approaches and innovative public health policies to bridge healthcare gaps [3]. In this context, health volunteering—particularly through digital platforms—offers an effective means for qualified medical professionals to deliver essential services such as consultations, diagnoses, and health education to populations with limited access [17]. Beyond providing direct care, volunteering also contributes to reducing healthcare costs, easing the burden on public health systems, and promoting a culture of social responsibility among healthcare workers [12].

Despite significant government investments in Algeria aimed at improving healthcare access—including the development of infrastructure, acquisition of medical equipment, enhancement of medical education, and deployment of digital health services [7]—there remains a substantial need to improve service quality and expand coverage to more disadvantaged regions. This challenge is not unique to Algeria. In many developing countries, healthcare services are heavily concentrated in urban areas. As such, DHV emerges as a promising solution to reach isolated populations. Digital platforms help overcome traditional barriers such as transportation difficulties, inadequate infrastructure, and imbalanced distribution of medical personnel [2]. This is particularly crucial in remote desert or mountainous regions where healthcare professionals are scarce. By leveraging technology, volunteer healthcare workers can offer remote consultations, monitor chronic conditions, and deliver preventive health education [3].

The study in [6] also emphasized the role of values, religion, and collectivist culture in motivating women to engage in volunteer work. Similarly, it was proposed a digital volunteer services platform to address key structural issues in the volunteer sector, including fragmented information, inefficient management of volunteer activities, and mismatched opportunities [18]. Such platforms aim to streamline volunteer engagement, making it more accessible and effective. Therefore, integrating digital platforms into health volunteering initiatives represents a powerful strategy to reduce healthcare disparities. As a result, DHV has become a strategic priority for public health policy and a critical area of academic inquiry—particularly in understanding the motivations and behavioral intentions of healthcare workers to participate in such initiatives.

Technology Acceptance Model

The TAM is a widely recognized framework for examining technology adoption intentions within the healthcare sector. Behavioral intention refers to "the degree to which an individual has formulated conscious plans to perform or not perform some specified behavior in future" [16]. In the context of this study, behavioral intention is defined as the healthcare worker's expressed willingness and likelihood to engage in volunteer activities using digital healthcare services to support underserved communities in the near future. The study in [15] revealed that intentions to engage in digital volunteering have a significant impact on actual digital volunteering behavior. However, the literature suggests that capturing volunteer behavior is complex due to the multiplicity and overlap of its determinants [19, 20]. Several studies have highlighted the need to extend TAM to enhance its predictive power [21, 22]. For instance, TAM has been expanded to include factors such as self-efficacy, trust, image and reputation, and perceived risk in the context of digital volunteering [7, 15]. Furthermore, several studies have identified OS, altruism, and social

responsibility as key determinants of charitable giving and philanthropic behavior [17, 23]. Therefore, to provide a more comprehensive understanding of the drivers of digital volunteering in our study context, we extended TAM by integrating three key constructs: OS, altruism, and social responsibility.

Hypothesis Development

Perceived usefulness

PU is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320) [16]. In the context of this study, PU refers to the degree to which healthcare workers believe that volunteering through digital healthcare platforms will enhance their ability to deliver effective and meaningful care to underserved communities. Studies have indicated that individuals who perceive digital technology as useful are more likely to develop a positive intention to use it [7, 14, 15, 22]. Thus, the following hypothesis is proposed:

H1. Healthcare workers' PU of digital healthcare services positively associated with their intention to volunteer digitally for underserved communities.

Perceived ease of use

PEOU refers to "the degree to which a person believes that using a particular system would be free of effort" (p. 320) [16]. In this study, PEOU refers to the extent to which healthcare workers believe that engaging in DHV is free of effort and can be performed smoothly without significant technical difficulties or barriers. Based on the TAM, studies have shown that PEOU positively influences the intention to use digital health technology (e.g., [7, 14, 22]). The study in [15] found that PEOU influences digital volunteering intentions indirectly through PU and attitudes. Accordingly, we propose the following hypothesis:

H2. Healthcare workers' PEOU of digital healthcare services positively associated with their intention to volunteer digitally for underserved communities.

Perceived organizational support

Although volunteers are unpaid, healthcare professionals typically work within institutional settings. Perceived OS refers to "the extent to which employees believe that their organization helps them use a particular system" (p. 1553) [24]. Perceived OS encompasses both

(1) the availability of technical/administrative resources (i.e., the practical "facilitating conditions" necessary for volunteering) and

(2) normative endorsement and legitimacy from the employer (e.g., time off, formal recognition, and training).

Here, OS is defined as the degree to which healthcare workers perceive that their healthcare institutions or affiliated organizations encourage, facilitate, and value their involvement in DHV initiatives for underserved populations. In this context, organizational approval can enable or constrain healthcare staff participation in volunteer activities. It was reported that physicians' willingness to use health technology is linked to support in terms of technological resources and training opportunities [25]. The study in [26] indicated that perceived OS can reduce work-related burden and stress by offering emotional support, while also fostering a greater willingness to adopt new technology. Moreover, the study in [27] revealed that OS significantly influences both employees' self-efficacy and intentions to adopt technology. It was found that OS indirectly influences physicians' intentions to use digital technology by enhancing their PEOU [28]. In the digital literature, perceived OS has been shown to be a strong predictor of employees' intentions to use technology [24, 25, 29]. Hence, the following hypothesis is formulated:

H3. Healthcare workers' perception of OS positively associated with their intention to volunteer digitally for underserved communities.

Altruism

Altruism represents an intrinsic motivational trait. According to [30], it refers to "a general predisposition to selflessly seek to help others". In our context, altruism denotes the intrinsic motivation of healthcare workers to help others, specifically their willingness to offer time and expertise voluntarily via digital platforms to improve the health outcomes of disadvantaged or underserved communities, without expecting personal gain. Altruistic behavior is influenced by cultural differences, particularly between individualistic and collectivist societies. In Muslim-majority countries such as Algeria, collectivism tends to prevail over individualism, as religious teachings promote cooperation, self-sacrifice, and helping others without expecting financial reward [6]. In the same vein, the study in [31] states that religion can strengthen altruistic tendencies and encourage individuals to place greater value on caring for others. Several studies have previously indicated a positive direct and indirect relationship between altruism and the intention to engage in helping and volunteering behaviors, driven by feelings of satisfaction and happiness (e.g., [6, 13, 20, 23, 30-33]. Therefore, the following hypothesis is posited:

H4. Healthcare workers' intrinsic altruism positively associated with their intention to volunteer digitally for underserved communities.

Social responsibility

Social responsibility reflects an internalized moral/ethical norm. Social responsibility, as used in this study, refers to healthcare workers' sense of ethical and professional duty to contribute to societal well-being by participating in DHV efforts aimed at addressing disparities in healthcare access and equity. It functions as a normative obligation [33]. It was found that social esteem and collective responsibility motivations significantly predicted individuals' intentions to volunteer [20]. Literature has revealed that an individual's sense of social responsibility is positively and directly associated with their likelihood of engaging in philanthropic activities [17, 23, 34] and positive behaviors related to volunteering, helping others, and active citizenship [19, 35]. Accordingly, it is expected that when healthcare professionals feel a heightened sense of social responsibility, they will be more motivated to engage in efforts—however minimal—to provide healthcare services to underserved populations. Accordingly, the hypothesis can be stated as follows:

H5. Healthcare workers' sense of social responsibility positively associated with their intention to volunteer digitally for underserved communities.

Table 1. Measurement items

Variable	Item	Source
PU	PU1. Using digital healthcare services improves the quality of healthcare delivery to underserved communities. PU2. Digital healthcare services enhance my ability to address healthcare needs in underserved communities. PU3. I believe that digital healthcare services are beneficial for improving healthcare access in underserved areas.	[16]
PEOU	PEOU1. I find digital healthcare services easy to learn and use. PEOU2. Using digital healthcare services requires minimal effort on my part. PEOU3. I feel comfortable using digital healthcare services without extensive training.	[16, 21]
Perceived OS	OS1. My healthcare organization provides adequate resources for digital volunteering initiatives. OS2. My organization encourages healthcare workers to engage in digital volunteering for underserved communities. OS3. I feel supported by my organization in participating in digital healthcare volunteering.	[26, 27]
Altruism (AL)	AL1. I feel a strong personal desire to help underserved communities through healthcare services. AL2. Helping vulnerable populations through digital healthcare volunteering gives me a sense of fulfillment. AL3. I am motivated to volunteer digitally because I care about the well-being of underserved individuals.	[30]
Social responsibility (SR)	SR1. I feel a responsibility to contribute to the healthcare of underserved populations. SR2. Providing healthcare services to underserved communities is part of my professional duties. SR3. I believe healthcare workers have an ethical obligation to address health disparities in underserved communities.	[34]
Intention to volunteer digitally (IV)	IV1. I intend to participate in digital healthcare services for underserved communities in the future. IV2. I am willing to volunteer through digital healthcare platforms for underserved populations. IV3. I plan to contribute to digital healthcare services for underserved communities within the next year.	[7, 15]

MATERIALS AND METHODS

Measurement Tool

This study employed a quantitative approach using a self-administered paper-based questionnaire as the primary data collection instrument. The questionnaire consisted of two parts. The cover page explained the scientific purpose of the study, emphasized the voluntary nature of participation, and assured respondents that their answers would remain confidential and anonymous. A consent form was also included. In Algeria, where the study was conducted, research involving anonymous, non-clinical, survey-based questionnaires with adult participants does not require formal approval from a national research ethics committee. Nevertheless, all procedures adhered to established ethical principles.

The first part of the questionnaire focused on measuring the study constructs, using established and reliable scales adapted from previous studies to suit the context of healthcare workers volunteering in digital healthcare services for underserved communities. PU was assessed using a scale developed by [16], while PEOU was measured using a scale adapted from [16, 21]. Perceptions of OS were measured using scales adapted from [26, 27]. Altruism was measured using items from [30]. Social responsibility was assessed using items adapted from [35], and behavioral intention was assessed using a scale adapted from [7, 15]. Each construct was measured using three items. Respondents were asked to indicate their level of agreement on a five-point Likert scale, ranging from (1) “strongly disagree” to (5) “strongly agree.” The second part of the questionnaire collected demographic information, including gender, age group, profession, and years of professional experience.

The original questionnaire was developed in English and subsequently translated into Arabic, the native language of the respondents, by two bilingual academics (both with doctoral degrees in public health/healthcare management). A back-translation procedure was then applied, a different bilingual expert with a PhD in management translated the Arabic version back into English. The two English versions were compared to check conceptual equivalence and resolve discrepancies. A pilot study was then conducted with 20 participants to assess the clarity and comprehensibility of the questions. Minor revisions were made based on the pilot results, leading to the final version of the questionnaire. **Table 1** shows the measurement items and their sources.

Sample and Data Collection

The target population consisted of healthcare workers—general practitioners, specialists, and nurses—employed in public or private hospitals across cities in northern Algeria. Given the impracticality of surveying all healthcare personnel, a convenience sampling method was employed to recruit respondents. The initial target sample comprised 200 individuals. Questionnaire distribution began in February 2025, with the assistance of several healthcare workers. Efforts were made to ensure the sample was as representative as possible in terms of gender, age, and professional experience. Respondents were approached at various locations, including hospitals and private clinics, outside of their working hours to avoid inconvenience and to allow adequate time for participation. On average, completing the questionnaire required approximately five minutes. After one month of data collection, 153 responses were obtained, yielding a response rate of 76.50%. Following data screening, 11 questionnaires were excluded due to incomplete responses, resulting in a final valid sample of 142 questionnaires suitable for statistical analysis.

RESULTS

Demographic Characteristics

Table 2 presents the demographic and professional characteristics of the 142 healthcare workers who participated in the study. The gender distribution was relatively balanced, with a slight majority of female respondents (54.93%) compared to males (45.07%). In terms of age, the largest proportion of participants (47.89%) fell within the 36-50 years category, suggesting a mid-career demographic, while younger (18-35 years) and older (> 50 years) groups represented 27.46% and 24.65% of the sample, respectively. Regarding occupation, general practitioners constituted the largest group (42.96%), followed by nurses (35.91%) and specialist physicians (21.13%), reflecting a diverse range of clinical roles. Professional experience was well distributed, with the highest

Table 2. Respondents' profiles (n = 142)

Variable	Categories	Frequency (N)	Percentage (%)
Gender	Female	78	54.93
	Male	64	45.07
Age	18-35 years	39	27.46
	36-50 years	68	47.89
	> 50 years	35	24.65
Occupation	General practitioners	61	42.96
	Specialist physicians	30	21.13
	Nurses	51	35.91
Professional experience	< 5 years	28	19.72
	5-10 years	42	29.58
	11-15 years	45	31.69
	> 15 Years	27	19.01

Table 3. Descriptive statistics and Cronbach's alpha

Constructs	Mean	Standard deviation	Alpha	Skewness	Kurtosis
PU	3.74	0.57	0.773	-0.470	1.227
PEOU	4.17	0.72	0.877	-1.345	2.063
Perceived OS	3.59	0.77	0.955	-0.943	1.466
Altruism	3.75	0.77	0.941	-1.430	2.438
Social responsibility	3.26	0.75	0.940	-0.918	0.674
Intention to volunteer	3.94	0.80	0.904	-1.380	2.238

Table 4. Correlation matrix

Constructs	1	2	3	4	5
1. PU	-				
2. PEOU	0.203*	-			
3.Perceived OS	0.168*	0.517**	-		
4. Altruism	0.176*	0.672**	0.602 **	-	
5. Social responsibility	0.218**	0.653**	0.646**	0.731**	-
6. Intention to volunteer	0.294**	0.752**	0.652**	0.762**	0.782**

Note. **Correlation is significant at the 0.01 level & *Correlation is significant at the 0.05 level

proportion having 11-15 years of experience (31.69%), and nearly one-fifth of the sample (19.01%) reporting more than 15 years of experience.

Descriptive Analysis

Table 3 presents the descriptive statistics, internal consistency, and normality indicators. The mean scores across all variables ranged from 3.26 for social responsibility to 4.17 for PEOU, indicating generally favorable perceptions among respondents toward digital volunteering and its associated motivational factors. Notably, intention to volunteer received a relatively high mean of 3.94, suggesting a strong willingness among healthcare workers to engage in digital healthcare services for underserved populations. The internal consistency for all constructs exceeded the acceptable threshold of 0.70 as recommended by [36], with Cronbach's alpha values ranging from 0.773 for PU to 0.955 for perceived OS, confirming high reliability of the measurement scales. Furthermore, the normality assumption was supported for all constructs, as "skewness values fell within the acceptable range of ±2 and kurtosis values remained within ±7" [12].

Table 4 presents the correlation matrix showing the relationships among the study constructs, with a particular emphasis on their association with the intention to volunteer. All independent variables demonstrated statistically significant and positive correlations with intention to volunteer, suggesting that higher levels of PU ($r = 0.294$, $p < 0.01$), PEOU ($r = 0.752$, $p < 0.01$), perceived OS ($r = 0.652$, $p < 0.01$), altruism ($r = 0.762$, $p < 0.01$), and social responsibility ($r = 0.782$, $p < 0.01$) are associated with stronger intentions among healthcare workers to engage in DHV. Among these, social responsibility and altruism exhibited the strongest correlations with intention, followed closely by PEOU and perceived OS, highlighting the role of both intrinsic motivations and structural enablers.

Hypothesis Testing

Table 5 summarizes the results of the hierarchical regression analysis examining the factors associated with healthcare workers' intention to volunteer in digital healthcare services. Multicollinearity diagnostics confirmed the reliability of the model, with all VIF values remaining below the threshold of 5 and tolerance values exceeding 0.20, as recommended by [37].

In model 1, the core TAM variables—PU and PEOU—jointly accounted for 58.1% of the variance in intention to volunteer ($F = 98.790$, $p < 0.001$). Both variables were statistically significant, with PEOU showing a stronger association with intention ($\beta = 0.797$, $p < 0.001$), compared to PU ($\beta = 0.206$, $p = 0.009$). In model 2, the extended model incorporated perceived OS, altruism, and social responsibility, which increased the explained variance to 75.6% ($F = 88.574$, $p < 0.001$). All five variables in the extended model demonstrated significant associations with intention. Notably, social responsibility ($\beta = 0.313$, $p < 0.001$) and altruism ($\beta = 0.247$, $p = 0.001$) showed relatively strong associations, reflecting the role of personal and ethical values. PEOU continued to display a substantial association ($\beta = 0.338$, $p < 0.001$), and both OS ($\beta = 0.150$, $p = 0.012$) and PU ($\beta = 0.142$, $p = 0.018$) remained significant contributors. Therefore, hypotheses **H1** through **H5** are supported.

Table 5. Hierarchical regression analysis results

Models	Constructs	B	t	Significance	Tolerance	VIF	F (adjusted R^2)
Model 1	(constant)	-0.155	-0.444	0.658			F = 98.790 ($p < 0.001$; R^2 = 0.581)
	PU	0.206	2.653	0.009	0.959	1.043	
	PEOU	0.797	12.977	0.000	0.959	1.043	
Model 2	(constant)	-0.489	-1.787	0.076			F = 88.574 ($p < 0.001$; R^2 = 0.756)
	PU	0.142	2.389	0.018	0.945	1.058	
	PEOU	0.338	5.136	0.000	0.487	2.054	
	POS	0.150	2.546	0.012	0.543	1.843	
	Altruism	0.247	3.537	0.001	0.383	2.610	
	Social responsibility	0.313	4.281	0.000	0.366	2.729	

DISCUSSION, IMPLICATIONS, AND LIMITATIONS

Discussion

This study examined the antecedents of healthcare workers' intentions to engage in digital volunteering for underserved communities. The findings indicate that PU is significantly associated with positive intentions toward digital volunteering. This suggests that healthcare workers who perceive greater intangible benefits and potential gains from digital volunteering tend to report higher willingness to participate. This observation is consistent with assumptions of the TAM and aligns with previous research showing that perceived benefits are closely associated with engagement in digital volunteering [7, 14, 15] and the adoption of digital technologies for various purposes (e.g., [21, 27]). Although volunteering is inherently voluntary and unpaid, it often provides valuable experience and personal satisfaction [11]. In this regard, it was noted that altruistic behavior, volunteering, and helping others are associated with enhanced well-being and overall life satisfaction [38]. The PU of digital volunteering may encompass enhanced communication and collaboration, opportunities for learning and skill development, improved professional reputation, greater job flexibility, and a sense of fulfillment derived from serving disadvantaged populations.

Furthermore, the analysis indicated that PEOU is significantly associated with positive intentions toward digital volunteering for underserved communities. This suggests that healthcare workers who perceive the technology as easy to use tend to report greater willingness to engage in volunteering. This finding is consistent with numerous previous studies demonstrating the role of PEOU in both the acceptance of digital volunteering [7, 14, 15] and the adoption of digital health technologies [21, 27]. In the context of DHV, PEOU reflects the expectation of minimal effort required to perform volunteer tasks. Perceptions of ease of use may be related to factors such as support from peers or organizational leadership, access to training and learning resources, and the usability and quality of the digital volunteering platform [3, 11].

In addition, our study found that perceived OS is significantly associated with digital volunteering intentions. This observation aligns with previous research reporting positive associations between OS and willingness to adopt technology [24, 25, 28, 29]. OS may help reduce perceived barriers to volunteering and foster more favorable attitudes toward such initiatives. In this context, healthcare institutions are more likely to provide technical and administrative support to volunteers when they recognize the importance and feasibility of digital volunteering, including considerations such as cost-benefit analyses. Since volunteering is an unpaid activity, it generally requires minimal financial investment—particularly in digital contexts, where costs are lower than those of traditional, on-site volunteering. Accordingly, healthcare organizations may provide appropriate support to volunteers [5], especially when such efforts target underserved communities and contribute to narrowing health disparities, which aligns with the Algerian government's healthcare goals.

In practical terms, DHV relies on reliable and user-friendly platforms, which could be developed or overseen by the Ministry of Health due to its national reach. Volunteers may also require technical assistance during system malfunctions, as well as training programs to improve digital literacy and familiarize new participants with tools used in remote healthcare service delivery. Beyond technical and material support, emotional and moral encouragement may play an important role. Public recognition of volunteers, verbal appreciation from supervisors, and inclusion of digital volunteering in performance evaluations or professional development plans can enhance motivation and retention. Structural and policy-related support may include offering flexible working hours for volunteer activities or formally integrating digital outreach into national or hospital-level health strategies. Such measures may help reduce perceived workload burdens and alleviate technological anxiety among healthcare workers [26, 39].

Moreover, the study found that altruism is significantly associated with intentions to engage in digital volunteering. This suggests that healthcare workers who report stronger altruistic motives tend to indicate higher willingness to volunteer for the benefit of underserved communities. This finding aligns with previous research highlighting that altruistic motivations are closely associated with participation in volunteer activities [13, 20, 30-33]. For many healthcare professionals—particularly those in Algeria or other Muslim-majority societies—altruism is not only a personal virtue but also a deeply rooted religious and cultural value [6, 13]. Altruism, defined as "the selfless concern for the well-being of others," is consistent with Islamic principles, where charity and service are fundamental teachings. These principles encourage individuals to dedicate their time, skills, and resources to assist others—especially the poor and the sick—without expecting financial compensation [4, 6]. For instance, during the COVID-19 crisis in Algeria, both traditional and digital forms of volunteering emerged to support patients, including donations to those in need and the purchase of medical equipment [12]. In many cases, volunteers reported being motivated by a strong sense of moral and religious duty [7, 17]. Overall, altruism, particularly when embedded in cultural or religious values, is closely associated with the likelihood of participating in DHV.

In many cases, volunteers reported a strong sense of moral and religious duty [7, 17]. Altruism, particularly when grounded

in cultural or religious values, is closely associated with the likelihood of participating in DHV. Additionally, the study found that a sense of social responsibility is similarly associated with intentions to engage in digital volunteering. This highlights the importance of healthcare workers' awareness of their social and moral obligations to support disadvantaged communities [13]. When healthcare professionals report higher levels of internalized social responsibility, they tend to indicate greater willingness to volunteer their time and expertise for underserved populations [17]. This finding aligns with empirical research showing that volunteers' sense of social responsibility is strongly associated with both volunteer behavior and prosocial behavior [19, 20, 23, 33, 35]. It was noted that social responsibility is an important factor in sustaining volunteer engagement [35]. In this context, social responsibility refers to an internalized commitment to act in ways that benefit society, particularly by addressing social inequities and promoting the common good [34]. Digital volunteering provides a channel through which healthcare professionals may fulfill moral or social obligations by providing care, education, and support to populations facing barriers to access—whether due to geography, poverty, or systemic limitations. The decision to volunteer may reflect a desire to alleviate suffering and contribute to health equity. For instance, witnessing scenes of isolation and hardship may inspire healthcare workers to engage in volunteering, especially when they consider having received their medical education free of charge, which can heighten a sense of obligation to give back. In Algeria, it is common for medical teams to travel to remote areas to provide check-ups or perform surgeries. Many doctors have also responded to calls for assistance by offering surgical procedures free of charge. These acts of service are closely associated with values of responsibility, compassion, and religious principles.

Finally, within the broader global health discourse on equity, service access, and digital transformation [39-41], digital volunteering is closely associated with efforts to address systemic inequalities in low- and middle-income countries [42]. In many of these settings, structural barriers, such as geographic isolation, shortages of medical personnel, and unequal distribution of healthcare resources, make digital health initiatives a valuable approach for reducing disparities [39, 41]. Cultural and religious values may also be related to how healthcare workers perceive and engage with digital volunteering platforms. For instance, in predominantly Muslim societies, norms emphasizing altruism, charitable service, helping others, solidarity, and social responsibility may be associated with TAM constructs (such as PU) and with higher levels of social responsibility, which in turn are associated with stronger intentions to volunteer. These culturally rooted motivations highlight the importance of contextualizing TAMs within local ethical, social, and religious frameworks, rather than focusing solely on the digital technology itself.

Practical Implications

The findings of this study offer valuable insights for key stakeholders, including the Ministry of Health, software developers, hospitals, health volunteer associations, and others. First, PEOU was most strongly associated with healthcare workers' intentions to engage in digital volunteering. This highlights the importance of designing user-friendly digital health platforms that promote familiarity and comfort among potential users [3]. Developers should prioritize intuitive interface design, minimize technical barriers, and ensure easy access and navigation. Offering training programs, interactive tutorials, and responsive technical support may further improve PEOU, particularly for healthcare workers with limited experience in digital technology. When digital platforms are perceived as easy to use, healthcare professionals tend to view them as facilitating rather than hindering their participation in digital volunteer initiatives.

Second, although its association was comparatively weaker, PU remained significantly related to volunteering intentions. This indicates that healthcare workers benefit from recognizing the practical value and tangible benefits of digital volunteering—both for patient outcomes and for their own professional development. Clearly illustrating how digital health platforms contribute to reducing health disparities and supporting underserved communities may reinforce the perceived value of such initiatives. Additionally, highlighting opportunities for skill development, such as telemedicine competencies and remote communication skills, can position digital volunteering as both meaningful community service and a professional growth opportunity.

Third, perceived OS was also associated with volunteering intentions, underscoring the role of healthcare institutions in supporting digital volunteering. Organizations can foster participation by formally recognizing volunteer efforts, offering flexible scheduling, integrating volunteering into professional development programs, providing targeted training, and addressing technical or procedural challenges [5, 41]. When healthcare workers perceive organizational support, they tend to report higher willingness to engage in volunteering. Leadership can contribute by modeling involvement or initiating DHV programs tailored to specific vulnerable groups, such as the elderly, women, or individuals with disabilities. To maintain engagement, organizations should operate efficiently, provide ongoing support, solicit volunteer feedback, and proactively address challenges [1].

Fourth, altruism was strongly associated with volunteering intentions, suggesting that many healthcare workers are guided by intrinsic values and a desire to help others without expecting personal reward [4]. Recruitment strategies may benefit from appealing to these internal values by highlighting the real-life challenges faced by underserved populations and opportunities to contribute meaningfully through remote care. Framing digital volunteering as an extension of professional compassion may be associated with higher engagement. Providing impact metrics (such as the number of patients supported, consultations delivered, or improvements in health outcomes) can offer volunteers moral affirmation of their efforts. In contexts such as Algeria, where religion plays a central role, linking volunteering to Islamic principles that emphasize altruism, cooperation, and care for the needy may further reinforce motivation and align spiritual values with service to vulnerable populations.

Finally, social responsibility was associated with intentions to engage in digital volunteering, indicating that healthcare workers tend to report a sense of civic duty and moral obligation toward marginalized populations. Healthcare organizations and policymakers may frame digital volunteering initiatives around themes of social justice, public service, and health equity. Emphasizing the contribution of volunteering to reducing disparities and improving community well-being may reinforce volunteers' moral motivation. Incorporating testimonials from beneficiaries can further

highlight the social impact of participation, while aligning individual efforts with broader organizational social responsibility goals can strengthen the overall perceived value. Framing digital volunteering as a collective community effort may also foster a culture of social responsibility at both organizational and individual levels.

Limitations and Directions for Future Research

Although this study provides valuable insights, several limitations should be acknowledged. First, the use of convenience sampling and a relatively small sample size (n = 142) may limit the generalizability of the findings. Participants were drawn exclusively from northern Algeria, and the results may not fully represent the perspectives of healthcare workers in other regions or international contexts. Future research could employ probability-based sampling techniques, larger and more diverse samples, and comparative studies across regions or countries to enhance external validity. Additionally, qualitative methods, such as in-depth interviews or focus groups, could be incorporated to gain richer insights into the motivations and barriers associated with digital volunteering.

Second, while the extended TAM in this study incorporated OS, altruism, and social responsibility, other potentially relevant factors—such as facilitating conditions, computer self-efficacy, technology anxiety, religious values, collective responsibility, digital literacy, incentives, and workload constraints—were not examined. Future research could investigate these variables to provide a more nuanced understanding of factors associated with digital volunteering. Moreover, incorporating alternative theoretical frameworks—such as the unified theory of acceptance and use of technology or self-determination theory—may offer a broader perspective on the psychological, contextual, and motivational factors linked to healthcare workers' engagement in DHV.

Third, this study was conducted within a single national context—Algeria—which may limit the applicability of the findings to other cultural or healthcare systems, given the complex nature of digital volunteering behavior. Comparative studies across different countries or regions could examine how cultural, organizational, contextual, institutional, and political factors are associated with healthcare workers' intentions to engage in DHV. Such cross-national research could provide insights into both universal and context-specific correlates of digital volunteerism.

Fourth, although a rigorous translation and cultural adaptation process was implemented—including expert bilingual translation, back-translation, and a pilot test—some risk of subtle meaning loss or culturally specific interpretations may remain, which could affect measurement validity. Additionally, the cross-sectional design of this study limits the ability to establish temporal ordering, and reverse causation cannot be ruled out. Future research could employ longitudinal or experimental designs to strengthen understanding of directional relationships. Cross-cultural validation studies are also recommended to further assess the robustness and cultural equivalence of the measurement instruments.

Finally, this study focused solely on direct antecedents of intention and did not examine potential mediating or moderating variables, actual volunteering behavior, or intentions to continue digital volunteering over time. Future research could address these aspects to provide a more comprehensive understanding of the mechanisms associated with digital volunteer engagement and long-term participation.

CONCLUSION

Underserved communities continue to face significant challenges due to limited access to adequate healthcare services. With the advancement of digital technology, digital volunteering provides new opportunities for healthcare professionals to contribute to reducing these gaps and supporting residents in underserved areas. The effective implementation of DHV programs requires a deeper understanding of the factors associated with healthcare workers' engagement in such initiatives.

This study explored the factors associated with healthcare workers' intentions to participate in digital volunteering for underserved communities. To achieve this, the TAM was extended to include three additional factors: perceived organizational support, altruism, and social responsibility. The analysis indicated that PEOU, social responsibility, altruism, perceived OS, and PU were each significantly associated with intentions to engage in digital volunteering. The extended TAM accounted for 75.60% of the variance in volunteer intention, suggesting that including psychological, contextual, and organizational factors may provide a more comprehensive understanding of healthcare workers' engagement in DHV. These findings offer valuable insights for stakeholders seeking to encourage participation among healthcare volunteers and may inform future research aimed at further developing the theoretical foundations of digital volunteering and addressing barriers to participation.

Ultimately, reducing healthcare disparities in developing countries requires collaborative efforts from all stakeholders. Digital volunteering represents a feasible, low-cost approach that relies more on organization and leadership than on financial resources, highlighting its potential as a practical strategy for expanding healthcare access in underserved regions.

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