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Designing an acceptance model and using public health apps by Iranian users

Shahrzad Ghalyan¹, Sedighe Heydarinejad¹, Rasool Nouri², Amin Khatibi¹

Abstract:

BACKGROUND: Nowadays, there are hundreds of mobile applications related to sports, health and fitness. The benefits of using mobile phones in physical activity can be seen in the increasing use of mobile health applications. The purpose of this study was to design a behavioral model of acceptance and use of public health apps by Iranian users.

MATERIALS AND METHODS: The present study was a qualitative and exploratory approach that was conducted based on the theme analysis method (team). The statistical population included programmers and designers of sports programs and academic specialists in the field of sports and computers. Data collection was performed through review of documents, backgrounds and semi-structured interviews. The interviews were conducted in person or by telephone and each interview lasted about 20 to 40 minutes.

RESULTS: In total, 249 key points with marker codes were extracted from 14 interviews which were classified into 21 sub-themes and 6 main themes (app quality, digital literacy, social influences, facilitating conditions, intention to use, trust and accept the app. Finally, the pattern of acceptance and use of health apps by Iranian users were presented in accordance with UTAUT theory.

CONCLUSION: The results of this study can help the officials of the federation, public sports boards and clubs to use information and communication technology as a media in their strategies and programs to develop sports and health at the community level. It also contributes to social vitality and improves the quality of life of individuals.

Keywords:

Health, mobile application, physical fitness

¹Department of Sport Management, Shahid Chamran University of Ahvaz, Ahvaz, Iran,

²Department of Health Information Technology Research Center, School of Management and Medical Information Sciences, Isfahan University of Medical Sciences, Isfahan, Iran

Address for correspondence:

Dr. Amin Khatibi,
Department of Sport Management, Shahid Chamran University of Ahvaz, Ahvaz, Iran.
E-mail: A-Khatibi@Scu.ac.ir

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Introduction

With the advent of smartphones in people's lives, mobile applications (hereon referred to as "apps") have created new markets for health app developers. As new features are added to mobile devices, mobile apps are gradually becoming more profitable and are growing faster than ever.^[1] Thus, the proliferation of mobile applications and their ease of use have led to their popularity and dramatic increase in use.^[2] One of the areas that has attracted the attention of users around the world is health apps. The fast expansion of information

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and communication technology (ICT) use has provided easier access to online health information.^[3] In general, health apps can be divided into two categories: (1) disease management apps and (2) fitness and general health apps.^[4]

Providers of fitness and public health programs use these programs to train and use some health tools which are able to improve community health at a low cost and are also effective in managing chronic diseases.^[5] Finding new ways to motivate adolescents to be active is important for physical and psychological well-being.^[6] So sports apps can be used as an important tool by business sports companies to meet

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the needs of users in addition to improving services. In addition to their numerous capabilities, these apps can save time, eliminate traffic problems and potential hazards, and learn sports movements without the presence of a trainer.^[7] The increasing use of mobile phones by users to monitor their health and fitness has led to a significant enhancement in mobile health applications.^[4] At present, there are hundreds of programs related to exercise, health and fitness, and the use of these apps is expected to increase significantly in the next few years.^[8] To this end, marketers have conducted numerous studies on how to accept and use mobile apps. As a result of the evolution of these studies, various models of technology acceptance have emerged; Theory of Reasoned Action, Theory of Planned Behavior, Technology Acceptance Model, Technology Acceptance Model-2, Innovation Diffusion Theory and, the most complete of them, the Unified Theory of Acceptance and Use of Technology. One of the most common patterns identified is the technology acceptance model. With the development of this model, Venkatesh *et al.*^[22] proposed a new model called the unified theory of acceptance and use of technology (UTAUT). This model brings together all the variables affecting behavior, and a more complex model for measuring individual behavior in accepting a new technology is presented which is able to express 69% of the intention (technology acceptance) of users, while previous models were only able to express about 40% of users' intentions.^[9]

Based on the UTAUT model, Alasmari and Zhang^[10] showed that variables such as learning expectation, effort expectation, social impact and learning characteristics in mobile phone, regardless of the moderating effects of gender, age and e-learning experience, predict students' goals for using mobile learning technologies. Alghazi *et al.*^[11] also developed the UTAUT model and showed that factors such as connectivity, compatibility, memory, device performance, network coverage and network speed have a positive and significant effect on students' intention to use mobile learning. According to Abdat^[12], variables such as performance expectation, social influence, and facilitator conditions have a positive and significant effect on behavioral intent to use social media programs.

Despite much research on the use of mobile applications, less attention has been paid to public health and wellness apps. Existing research also has limitations: for example, they have searched only a small number of databases and do not give much information about the use of sports apps, especially fitness. On the other hand, due to the prevalence of coronary heart disease and the lack of access to sports facilities and clubs for athletes and other segments of society, the need to use and follow sports activities through mobile phones is much greater than

before. Additionally, less attention has been paid to the views of Iranian users. Given the significant increase in the number of users of sports apps in Iran and the practical role of smartphones as a new technology in leisure and other elements of daily life, the present study intended to identify the factors affecting the acceptance of fitness apps to express the behavioral model of acceptance and use of public health apps by Iranian users.

Materials and Methods

Study design and setting

The present study was exploratory and was based on qualitative studies; the data were analyzed using the theme analysis method.

Study participants and sampling

The statistical population of the study included programmers and designers of sports programs and academic specialists in the field of sports and computers. In addition, the study sample was selected purposefully via snowball sampling, and data collection was continued until theoretical saturation. The researcher reached theoretical saturation after twelve interviews, but two other interviews were conducted and analyzed to increase reliability. Six of the participants were programmers and application designers, four were university professors of sports sciences and four were university professors of computer science.

Data collection tool and technique

After reviewing the research background, data collection was done through in-depth and semi-structured interviews. Interview questions were the following: 1) What are the factors that lead to the acceptance and use of public health apps? 2) Apart from the features of the app, are there any other factors influencing the users' intention to use it? At the end of each interview, the main messages were discovered by repeated study, and this led to the formation of the initial codes. Then, by comparing the codes, the main and sub-themes were created. MaxiCuda software was used to encode the data. In order to evaluate the reliability of the coder, three interviews were randomly selected and re-coded at 45-day intervals. The results were as follows: the total number of codes in two 45-day intervals was 104; the total number of agreements between the first and second codings was 42; and the total number of disagreements in these two times was 12. Thus, the retest reliability of the interviews conducted in this study was 80.76%. Given that this rate was more than 60%, the reliability of the coders was confirmed.

Ethical considerations

This study was derived from PhD thesis titled "Designing Users Behavioral Model in

Accepting and Using Sport Apps” with the code 1be09435-7005-4b4d-832e-4f19f1ee80ba, and received approved by the Research and Technology Deputy of Shahid Chamran University of Ahvaz. All participants in this research were healthy persons, who gave their consent prior to completing questionnaire.

Result

After the coding process, a total of 249 key points were extracted with marker codes in fourteen interviews. After removing duplicates, 130 categories related to the acceptance and use of fitness apps by Iranian users were mentioned. In Table 1, the main and sub-categories extracted from the interviews and the overall content of the research were grouped.

Finally, Figure 1 shows the pattern of acceptance and use of sports apps by Iranian users in accordance with the UTAUT, based on the views and opinions of experts and specialists in the field of sports and computer. It should be noted that in the present study, in addition to the theoretical constructs according to the empirical background and expert opinion, two constructs of digital literacy and app quality were added to the research, which was one of the innovations of this research.

Discussion

Based on the research findings, the identified themes are examined below.

App quality

One of the main themes in accepting and using health apps was the quality of the apps. In order to be a component of clarity and pleasure in the application, the selected images of the application, in addition to being

pristine, creative and new, must be of high quality.^[13] The quality of the app, including the design of the application, the suitability of the design of the application with the audience, the coherence of the program in terms of color, the use of graphic elements (images, icons, buttons, etc.) and proper use of contrasting colors for elements and backgrounds, can encourage users to use the sports apps. Therefore, the high quality of an application makes it powerful.^[14]

According to the results of the present study, four sub-themes, namely, feature of program content, user acceptance, user support and attractiveness of the program were included in this main theme. Relevant educational content, simultaneous multimedia content, multilingual services, automatic display of information and content to users, as well as visual appeal are the features of app content that ultimately increase the quality of the app. In this regard, Alipour Hafezi *et al.*^[15] found that if the appropriate training conditions and support for the use of a technology were provided, its acceptance by users could be done much faster. Mohammadi and Fathi^[16] also showed that factors such as technical support played an important role in influencing technology. González-Barato *et al.*^[17] also evaluated the numerous data collected with the application in their research, showing that more accurate information about the psychological responses of injured athletes was obtained than retrospective reports. Bearn *et al.*^[18] found that higher quality programs had a guide to physical activity as well as a greater number of techniques.

Digital literacy

The second major theme is digital literacy. Digital literacy is the ability to create and share meaning and concept in various forms; it also refers to creating, participating in, and communicating effectively and understanding the

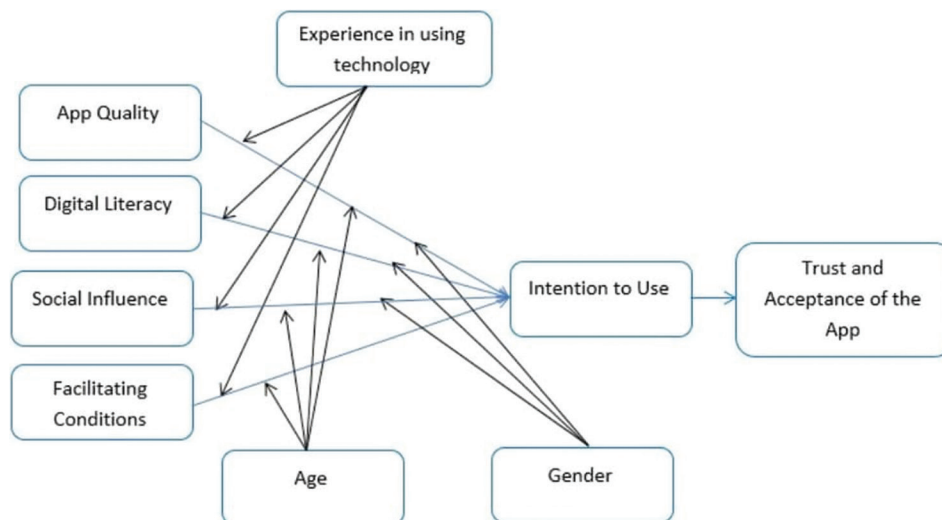


Figure 1: Conceptual model of users' acceptance and use of sports apps

Table 1: Themes, main and sub-categories of data analysis

Main themes	Sub-themes	Categories
App quality	Application content feature	Educational content relevant to the topic/Simultaneous presentation of multimedia content/ Providing services in multiple languages/Automatic display of information and content to users/ Visual appeal/Capability to store program information in the phone/Capability to publish sports performance in cyberspace/Capability to move and adjust text with image
	User acceptance	Providing standard and flexible sports programs with individual conditions/Having a competitive advantage (apps, users, trainers)/Announcing training time reminders/Providing results to other app users/Evaluating your (user) progress/Long-term use of the app/Pleasant experience in using the app
	User support	Responding to user requests/Ability to use the application online and offline/Multi-user application at the same time/Interactive communication with the application support
	The attractiveness of the program	Elegance and beauty in the way the app is designed/Registration of users' suggestions and comments/Answering users' questions/Providing incentive programs/Capability to do several things at the same time/Capability to change the appearance of the app by the user/Capability to view other users' comments
Trust and acceptance of the app	Expert support	Scientific programs of the app/App approval by scientific-research centers/Access to experienced and professional people/Capability to contact the creators of the app
	Reliability	Feedback to users/Coverage of a wide range of users (amateur and professional)/Capability to create integration in the program/Satisfaction of users/Ranking by users (number of stars out of 5)
	Perceived security	Protecting the security and immunity of the mobile phone/Specifying cookies-related policies/ Clearing privacy policies/Existing authentication and access mechanisms/Security of user information/Capability to configure an app with the user's physical features (personalization)/ Obtaining user approval in the case of a third-party accessibility of his data/The possibility of deleting the data provided by the user
Digital literacy	Knowledge transfer	Having instructions and guidance for using the app/Video or step-by-step training from beginning to end/Identifying why to use the app/User awareness of the benefits of the app/ Capability to share user experience with each other/Using the app to search for new sports information/Recommend and encourage other users to use the app
	Technical knowledge	Appropriateness of technology with the job of users/Capability to use the app in public/Mention the date of the last update/Mention the date of the user's last login/Request username, password, email, etc., when logging in/Domain of technology application/Complexity level of the app/Knowledge of using smartphones (Android, iOS, Mac)/Capability to connect to the internet and update the operating system of the phone/Capability to create profiles in online stores and download apps
	Compatibility	Capability to record and edit user information/Adaptation of sports services to the user's needs/ Capability to translate into the original language/Prevalence of app use by users/Increasing skills through app feedback/Developing user skills in compatibility with the app/Use of the app during low internet traffic hours
Social influences	Social conditions	Possibility of use in critical situations (floods, extreme heat, coronavirus)/Possibility of solving traffic problems and insecurity/Possibility of community dynamism/Possibility of impact of important global events/User education level/User personality type/Insufficient self-esteem to attend club/User social class
	Economic conditions	Free apps/Save on club travel/Profitability for app makers/Existence or absence of the capability to purchase sports equipment/Existence or absence of the capability to buy a smartphone/Willingness to spend for health/Lack of sports facilities
	Cultural conditions	Creating a culture of using technology for sports/Transmitting sports concepts to users/ Existence of sports culture in society/Having a sports family/Values and norms of society/High priority of fitness in society
	Advertising	Attract the user by offering a discount/Accreditation to the app through advertising in the media (radio and television)/Introducing the app through satisfied users/Use of celebrities from the app
Facilitator conditions	Influence from others	Positive experience of important people (coach)/Warning about possible dangers and injuries to previous users/Family support/Friends' suggestion
	Targeting the audience	Providing a program for people with specific diseases (heart problems, cerebral palsy, rheumatism)/Providing a program based on specific groups (normal people, athletes)/Providing a program based on different age groups (youth, elderly)/Different fitness programs for women and men/Availability of contraindications for users of the program (elderly, patients)
	Quick access	Capability to quickly access the desired content/Clear and understandable manner of using/ Easy installation and use of the program by the user/Easy use of various program menus
	Ease of use	Low volume of the program/Speed of information processing/Rate of access to the app in online stores/Easy interaction with the app/Ability to speed up sports movements/Easy use of the app's features (pen magnification, ability to search for content by keywords)

Contd...

Table 1: Contd...

Main themes	Sub-themes	Categories
Intention to use	Perceived utility	App's scientific credibility/Meeting different needs of users/Encouraging initiative and creativity of users/Increasing user sports information/Understanding the usefulness and applicability of the app/Increasing user confidence
	Side features	Capability to introduce related apps/No in-app ads and spam/Providing medical-nutritional advice/Saving user time/Saving user costs/Capability to fully review the features of the app
	Individual attitude	Number of downloads and installation of the program/Fun mode of the program/Not feeling tired while using/Other positive comments of users/Having previous experience (previous experience of using similar programs)/Interest in innovation

proper use of digital technology at the right time and in the right way in order to achieve certain goals. As digital literacy is rooted in the training of individual skills and abilities to identify and solve problems and challenges, the result is the acquisition of skills and abilities that help the user make effective use of available resources. These abilities, acquired in the form of training and learning in the individual, will enable his ability to interpret and use information to meet needs and improve the quality of life.^[19] According to the results of the present study, the following sub-themes were included: knowledge transfer, technical knowledge and adaptation.

Knowledge transfer is one of the most important processes of applying and creating knowledge to achieve higher performance. Knowledge is not only transmitted from person to group and from group to person, it is also transferred from one person to another and from one group to another.^[20] Abdolsamadi and Rafiyi Afarani^[21] believed technical knowledge to be one of the intellectual products that is made based on many thoughts and efforts and is specific to that person's mind, others are not aware of it and the owner of technical knowledge is not willing to disclose it. On the other hand, according to the research findings, high levels of adaptation to lifestyle and needs of people, including increasing the user's skills in adapting to the app, the prevalence of using the app by users and adapting sports services to the user's needs, increased the likelihood of accepting apps.

Social influence (SI)

Social influence refers to the level of influence of peers and other social relationships and is also known as subjective norms in the technology acceptance model (TAM) or social factors in the PC use model. Social influence is adjusted on the basis of gender, age, experience and voluntariness. Previous studies have shown that this theme has a significant effect on behavioral intention. The interaction between the user and technology, in turn, determines the degree of social influence because technology evolves from one level of tools to one social level.^[10] According to Venkatesh *et al.*,^[22] social influence is the extent to which one understands that others believe they should use a new system. Social influence is able to facilitate understanding of behavioral intention to adopt information technology. In the present study,

this theme included sub-themes of social conditions, economic conditions, cultural conditions, advertising and being influenced by others. Also, the possibility of using apps in critical situations, free apps, high priority of fitness in the community, the use of apps by celebrities and the positive experience of important people are the characteristics of social influences that can be very effective in accepting and using apps.

Facilitating conditions

Facilitating conditions refer to the degree to which one believes that there is a technical and organizational infrastructure to support the use of the system. In fact, the facilitating condition is similar to perceptual behavioral control and reflects that the users have the ability and resources to use the service. For example, users need mobile internet knowledge in order to use the service, as well as the need to pay for communication. If they do not have this knowledge and resources, they will not be able to accept the services.^[22] When users believe in the technical facilities and resources to support the system, they will have a higher expectation of acceptance. In other words, adequate hardware and software resources, IT knowledge, and technical knowledge availability are likely to reduce barriers to using apps. According to Tahriri and Afsai,^[23] users' perceptions of facilitating conditions lead to more acceptance of new systems by them. According to the results of the present study, three sub-themes—audience targeting, quick access and ease of use—were included in this main theme. Easy use of app features, clear and understandable how-to's and availability of prohibitions for users were among the factors that created facilitating conditions in this research. Pedrosa *et al.*^[24] also found that facilitating conditions were one of the main factors in the acceptance and use of technology.

Intention to use

Intention to use, performance of attitudes, and mentalities of the individual about the target behavior predict the actual behavior.^[25] The key to user retention is the decision to utilize users. Accordingly, marketers typically assume that satisfied users are more likely to be retained. Satisfied users also tend to use more services than dissatisfied ones.^[26] In this study, the intention to

use included sub-themes of perceived usefulness, side characteristics and individual attitude; understanding the usefulness of the app, providing medical-nutritional advice and the entertainment mode of the program were among the factors that made users decide to use it. In this regard, Mudabernia *et al.*^[27] believed that perceived desirability had the highest impact on behavioral intentions. Khodami *et al.*^[28] also found that personal innovativeness in information technology, perceived enjoyment (PE), social influence (SI), performance expectancy (PE) and compatibility had a positive and significant effect on the behavioral intention of using mobile advertising.

Trust and acceptance of the app

Trust is an important predictor of information sharing. Some researchers define trust as the belief of one party in the reliability of the other party's statements and commitments. They also believe that higher levels of trust between the buyer and seller will increase the likelihood of the relationship continuing.^[29] Bayani Hedesh *et al.*^[30] considered trust as an effective factor of online shopping. In fact, it can be said that despite the increasing use of the internet in Iran, e-commerce and online shopping have not become widespread enough, while online shopping has many benefits for society, customers and sellers. One of the biggest obstacles to the development of online shopping in the country is the lack of trust of the people in this new way of shopping and the unfamiliarity of institutions (active in this field) with trust-building mechanisms. App trust and acceptance in this study included the sub-themes of expert support, reliability and perceived security. Also, the app's scientific nature, access to experienced and professional people, user information security, coverage of a wide range of users, and specific user privacy policies build trust and ultimately lead to app acceptance. Venkatesh *et al.*^[22] also adopted the integrated model of acceptance and use of technology, assuming that the perceived probability of the individual to apply the behavior had a direct impact on actual use.

Conclusion

The aim of this study was to design a behavioral model of acceptance and use of public health apps by Iranian users through theme analysis. In the final model of the present study, the four factors of app quality, digital literacy, social influence, and facilitating conditions play a direct and important role in determining user acceptance. Furthermore, factors such as gender, age and experience of using the technology can indirectly affect the intention to use and ultimately the acceptance trust of users.

The results of this study can be considered as a comprehensive approach to understanding the behavior

of users in the acceptance and use of public health apps in the country. Thus, this will help federation officials, public sports boards and sports clubs implement their strategies and programs in order to develop sports and health at the community level, and the use ICT as more sports media. As a result, it will contribute to social vitality and improve the quality of life of individuals.

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Conflicts of interest

There are no conflicts of interest.

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