


# Evaluation of the usability of Drmyco web application using the think-aloud method

Fatemeh Pezeshki<sup>1</sup>, Hanieh Keikhay Moghadam<sup>2,3</sup>, Seyed Mehdi Mirzaei<sup>4</sup>, Fateme Moghbeli<sup>5\*</sup> 

<sup>1</sup>Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran

<sup>2</sup>Student Research Committee, Varastegan Institute for Medical Sciences, Mashhad, Iran

<sup>3</sup>Department of Nutrition Sciences, Varastegan Institute for Medical Sciences, Mashhad, Iran

<sup>4</sup>CEO, Matin Asman Pars Technics Foundation, Mashhad, Iran

<sup>5</sup>PhD in Medical Informatics, Assistant Professor, Varastegan Institute of Medical Sciences, Mashhad, Iran

## Article Info

### Article type:

Research

### Article History:

Received: 2024-02-14

Accepted: 2024-04-15

Published: 2024-04-20

### \* Corresponding author:

Fateme Moghbeli

PhD in Medical Informatics,  
Assistant Professor, Varastegan  
Institute of Medical Sciences,  
Mashhad, Iran

### Email:

fatemeh.moghbeli@gmail.com

### Keywords:

Usability Evaluation

Web Application

Drmyco

Thinking Aloud Method

## ABSTRACT

**Introduction:** Health information technology has great potential to address some of the challenges of developed and developing countries in providing accessible, affordable and high-quality healthcare services. Telemedicine uses health information technology to overcome geographic barriers and increase access to health care services. This is particularly useful for rural and disadvantaged communities in developing countries. There are many reasons for abandoning and failing the web application; one of the most important obstacles to their use is low applicability. The purpose of this study is to investigate the usability of Drmyco web application.

**Material and Methods:** Evaluation was done in a laboratory environment based on a pre-prepared scenario using the think-aloud method by 15 users (health information technology students from all over the country). Then the identified problems and identified problems were classified based on the Van den Haak method. The Nielsen method was used to evaluate the severity of the problems.

**Results:** The average duration of the evaluation process in this study for users was 22.06 minutes. The total number of problems identified by users was 19.

**Conclusion:** The two principles of Layout and Comprehensiveness were identified as the most problems for users.

## Cite this paper as:

Pezeshki F, Keikhay Moghadam H, Mirzaei SM, Moghbeli F. Evaluation of the usability of Drmyco web application using the think-aloud method. *Front Health Inform.* 2024; 13: 209. DOI: [10.30699/fhi.v13i0.598](https://doi.org/10.30699/fhi.v13i0.598)

## INTRODUCTION

Nowadays, the use of mobile phones has become widespread and most people benefit from this technology. In the past years, we saw the penetration of these technologies in the field of health and it continues [1, 2]. Computers and smart phones have created a new development such as telemedicine, where a person can benefit from medical services such as receiving online appointments and visits, medical advice and providing patient health records. When patients have access to technologies that allow them to take an active role in their health-related activities; their opportunity to participate in self-care increases. The number of eHealth web applications has increased exponentially in recent years [3]. Many reasons cause a web application to be abandoned and fail; one of the most important obstacles to their use

is low applicability [4, 5]. Usability examines various features of web applications, including ease of learning, efficiency, ease of remembering, error prevention, and user satisfaction. Therefore, it is felt to evaluate the applicability of health information systems [6, 7].

In fact, self-care is an activity in which a person uses his knowledge, ability, and awareness to take care of his health by relying on himself and independently. In self-care, every person should adopt a healthy lifestyle. The first step to reach a healthy society is self-care. In fact, 60% of diseases are reduced by self-care [8]. Today, a healthy lifestyle is considered an important factor in providing, maintaining and promoting health [9].

Chronic diseases are one of the main challenges of the health system [10]. Self-care behaviors play an

important role in the treatment and follow-up of chronic diseases. Studies show that when patients have access to technologies that allow them to take an active role in their health-related activities; their opportunity to take care of themselves increases [11].

Mobile technologies are more accessible to people than any other system and are rapidly penetrating the public and private sectors. One of the applications of mobile technologies is to use it as a health control tool. Mobile health, any health-oriented care that is supported by mobile phones, tablets, digital devices and any wireless device. In other words, it refers to the practice of medicine and public health supported by mobile devices such as cell phones, tablets, personal digital assistants, and wireless infrastructure [12].

Using mobile technologies, patients can manage or monitor their treatment or other health-related issues. Mobile technologies are becoming ubiquitous in the world and are changing the way of communicating and providing services and patient care [13, 14].

A web application or a web application is a software that is used using a web browser and through local networks or the Internet. Medical and health web applications are created not for fun but for need, which are of high importance and help people to solve any superficial, non-chronic and chronic problems and pain in their daily life. Also, people can find the specialist they need in any place through this platform and benefit from online visits [15].

Physical and mental health has been the most important priority for every person's successful life. The most important goal of medical and health web application design in today's world is education and awareness to maintain health and prevent diseases.

Some of the most compelling benefits of mobile technologies are in the areas of disease prevention, chronic patient monitoring, health management, and care delivery.

Evaluating the quality of websites and ensuring the appropriate design of their user interface are evaluation methods available in the field of usability. The purpose of usability evaluation is to solve specific service problems of the web application.

Usability refers to various features of the web application, including ease of learning, efficiency, ease of remembering, error prevention, and user satisfaction. The use of a health information system with high applicability guarantees the quality and improvement of software products with the aim of reducing errors and speeding up the work process, increasing the efficiency and effectiveness of these systems [5, 16].

One of the user-based methods is the think-aloud method, which is widely used. The Think Aloud

protocol is a method used by human factors researchers to provide empirical and procedural information about work processes or tasks. This work is done by verbally expressing the work performance methods by the participants in order to gain an insight into the cognitive components of the work [17, 18].

Based on the contents stated in relation to the importance of using web applications in the field of health, as well as the role of usability in the efficiency and quality of software, users in this study evaluated the usability of Drmyco web application.

One of the main goals of this article is to evaluate the usability of Drmyco web application using the think-aloud method in 2023. One of its sub-goals is to investigate how to receive online appointments, to investigate how to visit online in the form of video, telephone and text consultation and classification and to investigate the severity of usability problems of Drmyco web application by users.

## MATERIAL AND METHODS

The participants in this evaluation included the group of users. The users included 15 health information technology students from all over the country who had no knowledge and experience of Drmyco web application (drmyco.ir). Due to the fact that this study was conducted based on the ethical standards of the Declaration of Helsinki, before starting the evaluation, the generalities of the study and its objectives were explained to the users. Then written and verbal consent was obtained from them to participate in the study. Also, all user information was used confidentially and without revealing their names.

The evaluation was done in a quiet environment with sufficient light, a table and a chair, and a laptop equipped with the Windows operating system with an Internet connection. To carry out the evaluation process, equipment including Camtasia software version 2020 was used to record the user's interaction with the web application and record the user's voice.

Also, a scenario including 13 parts was designed based on the capabilities of the web application. There is a general method for evaluating usability, including evaluation through real user surveys. To evaluate the usability of Drmyco web application, the think-aloud method, which is one of the methods of real users, was used.

The think-aloud method is an experimental method based on observing the performance of the system during use. In fact, the purpose of this method is to collect information related to the evaluator's cognitive interaction with the system. In this method, the evaluator is asked to express what they see, think,

feel and make decisions. Before starting the evaluation, users were taught the method of thinking aloud. How to express thoughts, feelings and decisions was explained in detail for users for ten minutes.

After the end of the evaluation, the users were asked to give their suggestions for improving the performance of Drmyco web application. These suggestions were recorded in the report registration form.

After completing the evaluations, the researcher analyzed the files recorded by Camtasia software, audio files and report registration forms. The researcher independently prepared a list of usability problems expressed by the evaluator and their severity.

User problems were identified and their severity was merged into a final list. Van den Haak et al.'s method was used to classify problems. Based on this method, the problems were divided into four main categories: Layout, Terminology, Data entry and Comprehensiveness [19].

Nielsen method was used to evaluate the severity of problems. The Nielsen questionnaire was designed by Jacob Nielsen and includes 10 main components in evaluating the usability of a web application [20]. The principles mentioned in this checklist are: the clarity of the system status (awareness of the status of being placed in the system and entering the next stage), compatibility between the system and the real world, using familiar words and in accordance with the real world). User freedom of action and mastery of the system (the option to exit or enter the site easily), compliance with uniformity and standards, error prevention (preventing inappropriate data entry), recognition instead of reminders, flexibility and efficiency of use [21].

Helping users in diagnosis, identification and correction, aesthetic aspects and simple design and guidance and documentation. In Nielsen evaluation, these principles are used to identify system problems. After identifying the problems, the next consequences can be determined for the evaluator [22]. This method is an effective and low-cost way to evaluate clinical information systems and is currently widely taught and used to evaluate the usability of the

user interface. Based on the Nielsen method, the severity of problems was divided into five main categories (Table 1) [23]. However, severity graded as "0" was removed from the problem list by the consensus of researchers. The data was analyzed using SPSS 26 version 26 software.

**Table 1: problem five main categories**

Description	degree of severity
No usability problem	0
Cosmetic problem	1
Minor usability problem	2
Major usability problem	3
Usability catastrophe	4

## RESULTS

Users in this study included 6 men (40%) and 9 women (60%) with an average age of 22 years. The average duration of the evaluation process in this study for users was 22.06 minutes.

The total number of problems identified by users was 19. The classification and severity of the problems that users encountered in the evaluation process are shown in Table 2. According to this table, Layout problems were the most frequent with 13 cases (68.42%). The problems of comprehensiveness identified by users were 3 cases (15.7%). In this category, 2 problems were rated as severity 2.

The description of all problems identified by users and specialists can be shown in Table 3.

Finally, all the problems were given to the web app manufacturer and the problems were solved

## DISCUSSION

Carrying out usability studies on the web application of Drmyco in the field of health needs serious attention. Usability is an essential part of the development of this program, especially when its goal is to improve the physical conditions of the patient. In this study, the usability evaluation of Drmyco web application was done using the think-aloud method. During the evaluation process, 19 problems were identified by users, 7 of which had a severity greater than 2.

**Table 2: Classification and severity of usability problems identified by users**

Variables	Layout	Terminology	Data entry	Comprehensiveness
Usability Problem	13	2	1	3
Severity	1	2	0	1
	2	4	2	0
	3	5	0	2
	4	2	0	0

**Table 3: Identified usability problems**

Assessor problems	Users
Layout	<ol style="list-style-type: none"> <li>When entering the site, the user was faced with the notification that the site was not available (1 user).</li> <li>The user could not enter the PWA version Click on this version (2 users).</li> <li>The user cannot use the scroll next to the screen due to its small size (1 user)</li> <li>By clicking on the online visit in the site menu, the user is not transferred to the desired page for making an appointment (7 users).</li> <li>When the user entered the different options of the health file, the new page had extra space and no view or image. (10 users).</li> <li>After registration, the user did not receive any notification with the title (registered successfully) (2 users).</li> <li>When finding the desired specialist in the relevant city, the user was faced with limitations due to the lack of city selection filter (15 users).</li> <li>By clicking on the expert's resume, the user did not encounter a resume (10 users).</li> <li>At the time of the appointment process, there was no option to choose the desired insurance, and therefore the user must pay the visiting fee freely (12 users).</li> <li>The user did not see the tracking code in the registered version of his electronic health file (5 users).</li> <li>The user was not referred to the relevant article by searching for the desired word in the advanced search (7 users).</li> <li>When entering some items, the user faced irregularity of the page (10 users).</li> <li>The user believed that the vertical menu was better so that the important items such as: online visit, appointment, specialists and screening are placed in the menu at the top of the site (3 users).</li> </ol>
Terminology	<ol style="list-style-type: none"> <li>The user of some items, such as questions and answers, was faced with unintelligibility of the sentences. (10 users)</li> <li>In the electronic health record section, the user was faced with incorrect information such as date of birth, while it was already entered correctly (5 users).</li> </ol>
Data entry	<ol style="list-style-type: none"> <li>The user could not enter his physical information in his user panel. (10 users)</li> </ol>
Comprehensiveness	<ol style="list-style-type: none"> <li>The user believed that comprehensive training should be given in the form of video in completing the health file. (10 users)</li> <li>The user believed that when choosing a text consultation, it should be mentioned that this consultation will be done by the doctor within 24 hours from the exact time. (5 users)</li> <li>The user believed that there should be several screenings in the screening section so that the person can measure his body in terms of disease. (8 users)</li> </ol>

While participants rated the usability of the web application as generally good, there were some issues that could be addressed to improve the user experience. Most of the usability problems that users faced were in the Layout category (68.42%). Two of the most frequent cases were the presence of restrictions on access to specialists related to the users' city of life, as well as the right to free visits and no insurance. This problem may be due to not completing the cooperation of this web application with the experts of the relevant city and not having an agreement with different insurance companies. The most usability problems faced by users in receiving online appointments were in the Layout category. Two of the most frequent cases were the presence of restrictions on access to specialists and medical centers related to the city of the user's life, while there was no filter for selecting the city, and that is due to the limitation in the cooperation of this web application with different cities, and so on. It would have been better if the scope of this cooperation had been nationwide and all cities would have been covered, and in the other case, there was no possibility to choose the desired insurance, in this

sense, the visit fee had to be paid freely.

Vanicek T and et al., showed in the study that the usability the atlas and identify potential issues concerning selected topics in the atlas, as well as collecting participants' opinions on the product. The objective of article was to evaluate the usability of the Atlas of the Moravian-Silesian Region through the implementation of an experiment utilizing the think-aloud method. Three methods of data analysis were identified and applied: annotation analysis, linguistic analysis, and subjective analysis. The majority of the analysis was based on annotation analysis. In conclusion, the think-aloud method was shown to be a valuable tool for evaluating cartographic products, specifically atlases and the maps within them [24].

The most usability problems in the way of online visit in the form of video, telephone and text consultation have been evaluated in three cases. The first case was to communicate with the doctor through SMS, where the user could send a message to the relevant doctor before the specified date of his consultation and send tests, photos, etc. related to his illness to the doctor, and of course, the doctor himself would also send a message to the patient. Data to do this process,

however, if the patient does not receive the doctor's message, the support will contact him and solve this problem.

Santoso AR and et al., showed the usability of The Vokasiku which is a mobile application that provides certification test services, online courses, and information about scholarships and job vacancies. The usability evaluation of the Vokasiku application is carried out using a user approach in the test, namely the Think Aloud method. Measuring the level of user satisfaction is done by using the Questionnaire for User Interaction Satisfaction (QUIS). After testing by the user, there are several errors in the application, so it is necessary to design a user interface to solve the problems experienced by the user. The user interface made is a high-fidelity prototype and front-end application [25].

The second case, if the patient chooses the text consultation, the consultation process will be done within 24 hours, which means that this type of consultation may not be done at the specified time, however, the patient can contact the support and request that the doctor Make your visit at the same time and the doctor will be present in his text consultation at the same time.

The third case is the lack of tracking code of the version registered in the electronic health file. However, the tracking code of the registered prescription will be sent to you by SMS, but this code must be present in your prescription in the electronic health record, and in this section, after the consultation, the support will contact the patient to ensure that the patient has access to the tracking code.

One of the major problems of users with Drmyco web application is the limitation of this platform in cooperation with specialists and centers in different cities, as well as the lack of cooperation with different insurance companies. And according to the solution of these issues, the patient does not have to change his doctor if he is satisfied with the doctor in his city and needs a physical examination, and also if the web application is able to cooperate with different insurances, the patient does not have to change until after the visit. Continue to get your visit insurance premium from the relevant insurance offices [25].

It is suggested that even though the very good support of this web application cooperates properly in following up the conditions of its patients in the process of consultation, the management part of this web application should also pay special attention to the needs of its patients and ease the work of these people. In order to provide health services by expanding its cooperation with specialists and medical centers, it should also sign contracts with various insurance companies. On the other hand, the system problems of this web application, such as not

opening the web page, which is limited, should be fixed as soon as possible.

One of the limitations of this study was that the assessment sessions were conducted in a laboratory environment. Users may work more calmly with the web application under normal conditions and have different opinions about the problems and their severity.

It is recommended that before designing and implementing a web application in the field of healthcare, it should be evaluated in terms of usability in order to avoid possible errors. Because all the things that can limit the work of this web application must be considered and before it is provided to the user, it must be made sure that the user does not face any limitations.

## CONCLUSION

The results of the users' evaluation of the use of Drmyco web application show that even though this web application is new and it is expected that their design has been done with appropriate accuracy, based on the needs of users and existing standards in this field, but in some cases, it has many problems. Continuation and failure to correct these problems in the long term will have destructive effects on users' performance, because it causes problems such as fatigue, confusion, waste of time, and as a result, dissatisfaction of users, which in turn causes errors and as a result. It reduces the quality of treatment and ultimately threatens the health of patients. The results of this study showed that with more accuracy and compliance with existing standards and laws for designing web applications, especially standards related to human-computer interface, many problems can be prevented. Finally, these 19 problems were reported to the web application management of Drmyco so that the deficiencies can be fixed. Similar research work has not been done on this web app and this is the first evaluation on Drmyco web application.

## ACKNOWLEDGMENT

This study was supported by Varastegan Institute for Medical Sciences. We thank all students for the collaboration in this study.

## AUTHOR'S CONTRIBUTION

All authors contributed to the literature review, design, data collection and analysis, drafting the manuscript, read and approved the final manuscript.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest regarding the publication of this study.

## FINANCIAL DISCLOSURE

No financial interests related to the material of this manuscript have been declared.

## ETHICS APPROVAL

This study was approved after review and presentation in the Ethics Committee of Mashhad University of Medical Sciences (Code: IR.MUMS.REC.1402.036).

## REFERENCES

- Moghbeli F, Langarizadeh M, Moghadam YA, Hasanpour Heidari S. Design the conceptual model of teleconsultation system for dental diseases. *Frontiers in Health Informatics*. 2019; 8: 22.
- Cho H, Powell D, Pichon A, Kuhns LM, Garofalo R, Schnall R. Eye-tracking retrospective think-aloud as a novel approach for a usability evaluation. *Int J Med Inform*. 2019; 129: 366-73. PMID: 31445278 DOI: 10.1016/j.ijmedinf.2019.07.010 [[PubMed](#)]
- Maramba I, Chatterjee A, Newman C. Methods of usability testing in the development of eHealth applications: A scoping review. *Int J Med Inform*. 2019; 126: 95-104. PMID: 31029270 DOI: 10.1016/j.ijmedinf.2019.03.018 [[PubMed](#)]
- Moghbeli F, Langarizadeh M, Kouhestani A, Orooji A. Modeling the acceptance of hospital information systems among nurses: An extended technology acceptance model. *Frontiers in Health Informatics*. 2018; 7: 1.
- Mazaheri Habibi MR, Moghbeli F, Langarizadeh M, Fatemi Aghda SA. Mobile health apps for pregnant women usability and quality rating scales: A systematic review. *BMC Pregnancy Childbirth*. 2024; 24(1): 34. PMID: 38183035 DOI: 10.1186/s12884-023-06206-z [[PubMed](#)]
- Mohammadi G, Pezeshki F, Vatanchi YM, Moghbeli F. Application of technology in educating nursing students during COVID-19: A systematic review. *Frontiers in Health Informatics*. 2021; 10: 64.
- Van den Haak MJ, De Jong MD, Schellens PJ. Evaluation of an informational web site: Three variants of the think-aloud method compared. *Technical Communication*. 2007; 54(1): 58-71.
- Noohi S, Karamitanha F, Shoghli A. Self-care ability of the elderly and related factors. *Preventive Care in Nursing & Midwifery Journal*. 2022; 12(4): 19-25.
- Moghadam HK, Sabzghabaei B, Moghbeli F. The effects of dietary mobile apps on nutritional disorders: A systematic review. *Journal of Biomedical Physics & Engineering*. 2023; 13: 211.
- Arredondo A, Aviles R. Costs and epidemiological changes of chronic diseases: Implications and challenges for health systems. *PLoS One*. 2015; 10(3): e0118611. PMID: 25781625 DOI: 10.1371/journal.pone.0118611 [[PubMed](#)]
- Zhang L, Liu Z, Mo K, Pu W, Yin J, Ma Z, et al. Technological advances in out-of-hospital care: Digital solutions, Asia Pacific experiences, and inherent challenges. *Informatics and Health*. 2024; 1(1): 9-15.
- Zain DSM, Bowles FA. What do our future EFL teachers think about using mobile devices in class? *Applied Research on English Education*. 2024; 2(1): 1-14.
- Fan K, Zhao Y. Mobile health technology: A novel tool in chronic disease management. *Intelligent Medicine*. 2022; 2(1): 41-7.
- Montaseri N, Langarizadeh M, Bayani A, Moghbeli F. The effectiveness of self-management mobile health technology in chronic disease: A systematic review. *Shiraz E-Medical Journal*. 2018; 19(Suppl): e66310.
- Min Q, Wang X, Huang B, Xu L. Web-based technology for remote viewing of radiological images: App validation. *J Med Internet Res*. 2020; 22(9): e16224. PMID: 32975520 DOI: 10.2196/16224 [[PubMed](#)]
- Langarizadeh M, Moghbeli F, Ahmadi S, Langarizadeh MH, Sayadi M, Sarpourian F, et al. Design and evaluation of an educational mobile program for liver transplant patients. *BMC Health Serv Res*. 2023; 23(1): 974. PMID: 37684647 DOI: 10.1186/s12913-023-09989-1 [[PubMed](#)]
- Wolcott MD, Lobczowski NG. Using cognitive interviews and think-aloud protocols to understand thought processes. *Curr Pharm Teach Learn*. 2021; 13(2): 181-8. PMID: 33454077 DOI: 10.1016/j.cptl.2020.09.005 [[PubMed](#)]
- Johnson WR, Artino Jr AR, Durning SJ. Using the think aloud protocol in health professions education: An interview method for exploring thought processes: AMEE Guide No. 151. *Med Teach*. 2023; 45(9): 937-48. PMID: 36534743 DOI: 10.1080/0142159X.2022.2155123 [[PubMed](#)]
- Abtahi H, Amini S, Gholamzadeh M, Gharabaghi MA. Development and evaluation of a mobile-based asthma clinical decision support system to enhance evidence-based patient management in primary care. *Informatics in Medicine Unlocked*. 2023; 37: 101168.
- Dannala ASSK, Chunduri SS. Heuristic usability evaluation of the BTH student portal by applying Nielsen's heuristics. 2022.
- Munawar A, Usino W. User interface analysis to increase user experience on computer based test application: Case study SMK Negeri 4 Pandeglang. *International Conference on IT, Communication and Technology for Better Life*. Science and Technology Publications; 2019.
- Ivanova D, Mitev D. Usability strategy and guidelines for building an accessible web portal. *AIP Conference Proceedings*. AIP Publishing; 2021.
- Mahfudz MS, Agusti F, Zahra SA, Dhini BR. Heuristic evaluation analysis using the 10 Nilsen rule usability method on the KAI access application. *International*

- 
- Conference on Science, Health, And Technology. LPPM Universitas Duta bangsa Surakarta, Indonesia; 2022.
24. Vanicek T, Popelka S. The think-aloud method for evaluating the usability of a regional atlas. *International Journal of Geo-Information*. 2023; 12(3): 95.
25. Santoso AR, Untoro MC, Karnila S, Effendi YA. Evaluation of usability and user interface design on Vokasiku mobile application using think aloud. *AIP Conference Proceedings*. AIP Publishing; 2024.